Mining CONGRESS JOURNAL

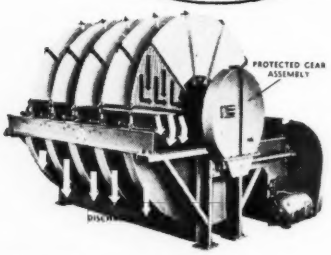
AUGUST 1956



DENVER CAN SUPPLY COMPLETE EQUIPMENT FOR YOUR MILL

One Responsibility

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DENVER DISC FILTERS
Give You These Advantages—

- DRIER FILTER CAKE, with positive gravity drainage of filtrate before blow-off.
- LOWER MAINTENANCE COST—all wearing parts are designed for long life.
- LARGER FILTER AREA per unit of floor space.
- WIDE OPERATING FLEXIBILITY—Two or more products can be filtered at the same time.
- Available in sizes from 2' - 1 disc to 9' - 12 disc.
- Drum Filters also available.

WRITE FOR BULLETIN NO. FG-B1.



DENVER High Capacity THICKENER is Completely *AUTOMATIC*

PROBLEM

Today's *new thickening techniques* require a new, high capacity thickener.

New flocculating agents that increase settling rates from 200% to 1000% mean *thickeners must move high tonnage* of fast settling solids and *handle overloads that build up fast.*

Faster settling takes place in less area and permits economy of smaller diameter thickeners.

SOLUTION

Spiral Rakes on DENVER *High Capacity* THICKENERS move solids to discharge in one revolution.

Completely automatic rake control handles overloads without attention and prevents damage to mechanism.

Low cost beam superstructure is used on sizes to 65' diameter. Simplified truss or bridge type is used from 65' to 125'.

COMPARE SPECIFICATIONS—PRICE

Every engineer planning a new thickener installation will want to study DENVER specifications. Compare sand raking capacity; shaft diameter; rugged, heavy-duty construction; totally enclosed, running in oil gears; automatic, foolproof rake lifting controls; acid-proof or standard construction; quick delivery.

You will agree the NEW DENVER *High Capacity* THICKENER more adequately meets ALL requirements of today's new thickening techniques.

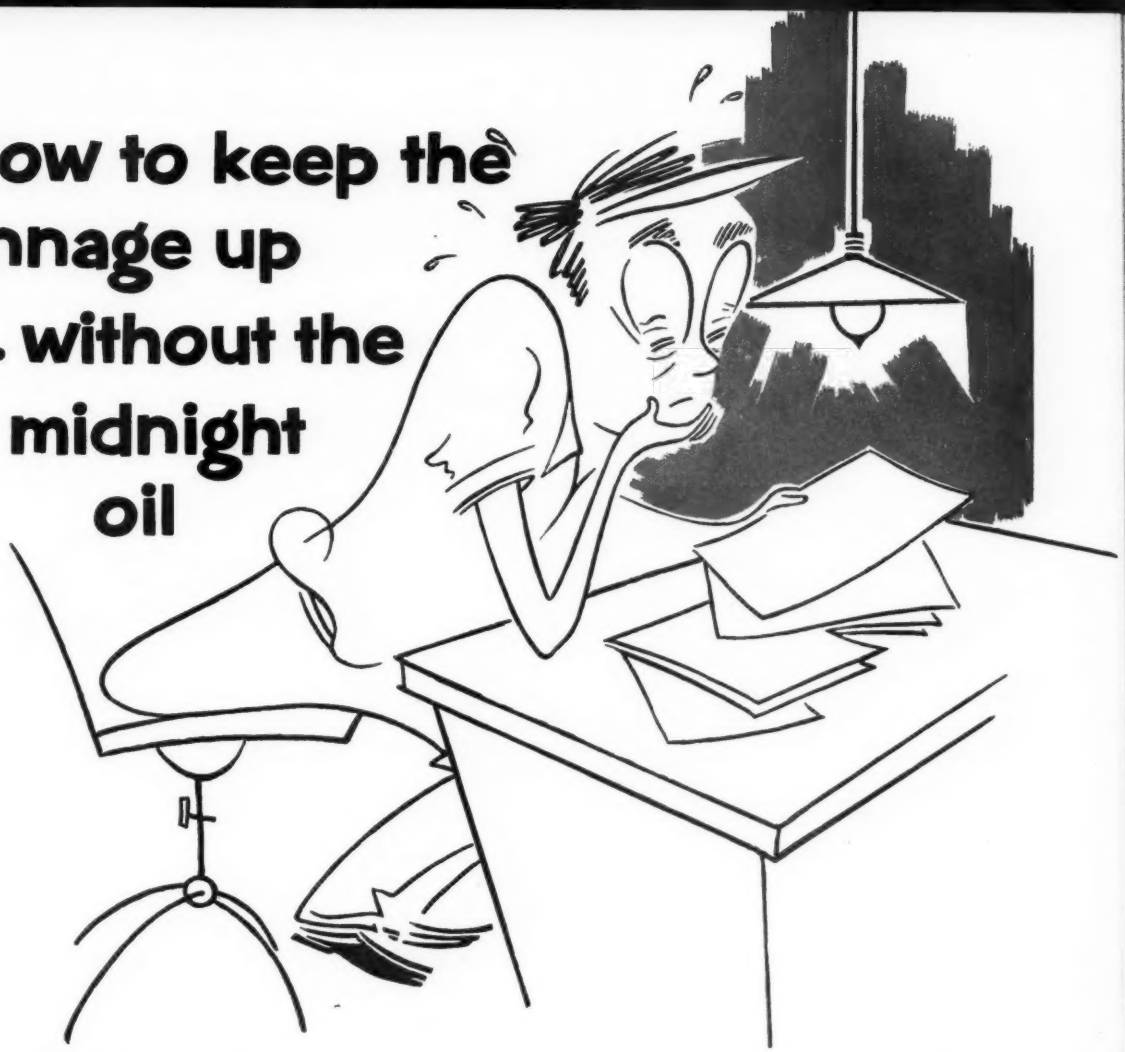
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How to keep the tonnage up ... without the midnight oil



Ever study nights to keep production up?

Probably so, if you haven't had mine cars working for you. Figures show that a mine car system never lets you down. The trips just keep rolling out the tonnage at a profit-making rate, with never a halt for more than a minute or two.

One car requiring repairs never affects the complete system...you just shunt it aside...and the rest of the cars keep rolling. No production interruptions. No production breakdown.

And that's not all. acf Mine cars give you flexibility, too...as you advance the face, just add new trackage, without stopping production. And two-way payloads; the trip that carries the coal out, carries men and supplies back in.

Mine operators have recorded actual cost and production figures that show the many advantages of an acf Constant Haulage Mine Car System. For full information, ask your acf Representative. Just write, wire, or phone any acf office.

AMERICAN CAR AND FOUNDRY DIVISION
acf Industries, Incorporated

Sales Offices: New York—Chicago—St. Louis—Cleveland—Washington—Philadelphia—San Francisco. *Plants:* Berwick, Pa., Huntington, W. Va., Milton, Pa., St. Charles, Mo., St. Louis, Mo.

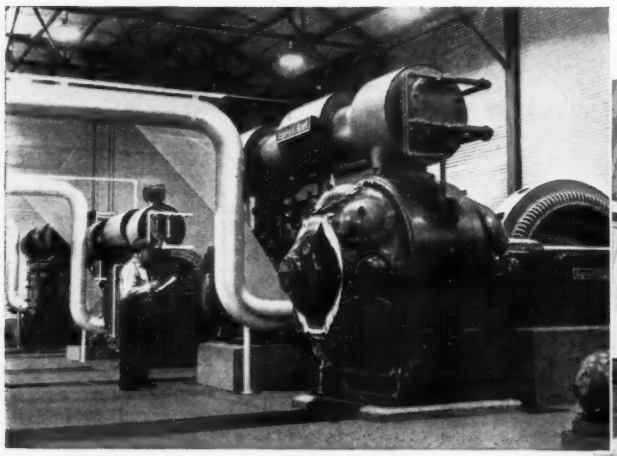


acf MINE CARS

for Constant Haulage

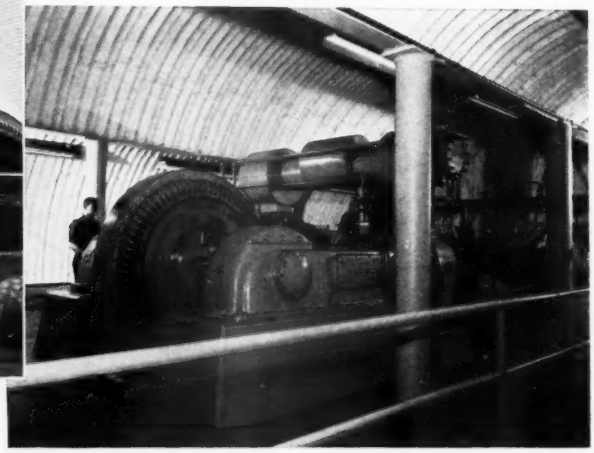
11,000 ft UP
or 4,000 ft DOWN

Ingersoll-Rand PRE Compressors keep rock drills working at top efficiency



Installed at an elevation of 11,500 feet above sea level, three 800-horsepower and two 600-horsepower Ingersoll-Rand PRE compressors, two of which are shown here, supply 100-psi air for Ingersoll-Rand rock drills at Climax Molybdenum Company's two-level development mining at Climax, Colorado. The modern compressor building is located on the surface, directly above the mine workings, which contributes to maximum efficiency for air distribution.

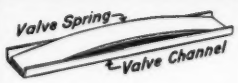
This dependable supply of air power helps keep pressure up to 90 to 100-psi at the cutting faces, thus assuring optimum results for the drilling operations which enable Climax to produce approximately 30,000 tons of ore per day.



Way down underground on the 1200 level, this 400-horsepower Ingersoll-Rand PRE compressor and two smaller units provide 100-psi drilling air for zinc and lead mining operations in Bunker Hill's Star Mine in the Coeur d'Alene district in Idaho.

Located 1200 feet below the shaft collar, these units feed into the same air line as another PRE unit on the *4,000 level*. With dependable I-R compressors at both ends of the system, line losses are reduced and full pressure is maintained at the drills.

Only I-R Compressors have CHANNEL VALVES



- High Efficiency
- Quiet Operation
- Remarkable Durability
- Air-Cushioned Action
- Corrosion-Resistant
- Channels are rigid
- Entirely different

Ingersoll-Rand PRE Compressors, of the horizontal, double-acting crosshead type, are heavy-duty machines built for continuous full-load service. Their extra stamina and low maintenance are big assets in mining service. The completely sealed frame keeps out dust and dirt. Running gear requires no internal adjustments.

Pipeless force-feed lubrication cuts operating and maintenance costs. These and many other features make the PRE an ideal compressor for use wherever large volumes of air are to be handled and pressures must be maintained within close limits over the complete capacity range. Ask your I-R representative for complete information.

Ingersoll-Rand IR

1-431

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Everyone who has anything to do with explosives should have a copy of this new, revised, up-to-date list of *instructions and warnings*, approved by the Institute of Explosives Makers.

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Contains vital precautions when shooting either electrically or with cap and fuse . . . eleven suggestions for minimizing poison gas hazards . . . prevention of misfires . . . approved methods for priming. Send for your *free copy today!*

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SYMONS® CONE CRUSHERS

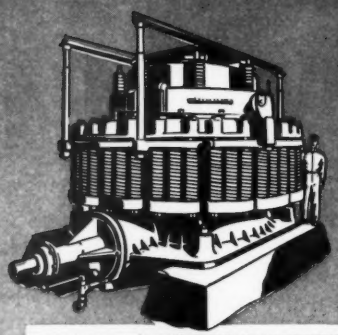
are the leading choice for large volume production of finely crushed material at low cost

In all of the great ore and industrial mineral operations throughout the world, ranging from Asbestos on through Zinc, Symons Cone Crushers have consistently aided man by making possible the efficient reduction of these materials to meet growing demands.

Continual repeat orders for Symons Cones from the world's leading ore and mineral producers conclusively establish this fact.

Whenever *you* are confronted with high capacity fine reduction crushing problems, it will pay you to investigate the advantages of Symons Cone Crushers . . . *the machines that revolutionized crushing practice.*

Nordberg Mfg. Co., Milwaukee, Wis.



• SYMONS Cone Crushers are built in Standard, Short Head, and Intermediate types, with crushing heads from 22 inches to 7 feet in diameter—in capacities from 6 to over 900 tons per hour.

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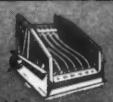
Symons Gyratory Crushers



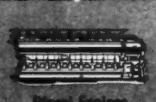
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AUGUST, 1956

VOLUME 42 ● NUMBER 8

Mining CONGRESS JOURNAL

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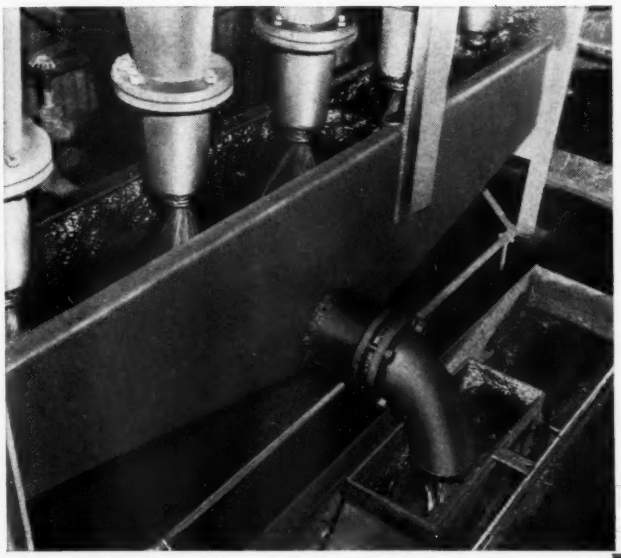
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[*Page 6*]

Fine Coal Recovery means

21 x 21 x 20 x 3 + X

(SUBSTITUTE YOUR OWN OPERATING FIGURES)



each month

H&P Cyclones recover salable fine coal at the rate of 21 TPH, about 21 hours per day, for 20 days of each month with a minimum return of $3 per ton. The "X" represents the expense to provide sufficient area for fine coal disposal.

Moreover, our numerous files indicate similar savings repeated in all sections of the coal field.

These applications can often be amortized by less than one year's production.

Heyl & Patterson CYCLONES

add to your profits, help in controlling density and let you operate through continued dry spells as water requirements are reduced.

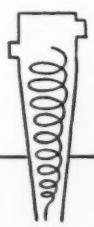
Only proper plant testing, followed by reliable laboratory analysis and competent application engineering guarantee an installation capable of giving you such good returns. H&P has all these facilities ready to serve you.

CHECK THESE ADVANTAGES!

- ☐ **Closed circuit operation**
- ☐ **Recovery of fine coal**
- ☐ **Prevention of stream pollution**
- ☐ **Controlled washing water densities**
- ☐ **Conservation of water**
- ☐ **Sharp classification for washing operation**

Get All The Facts... Write For Booklet CT-954

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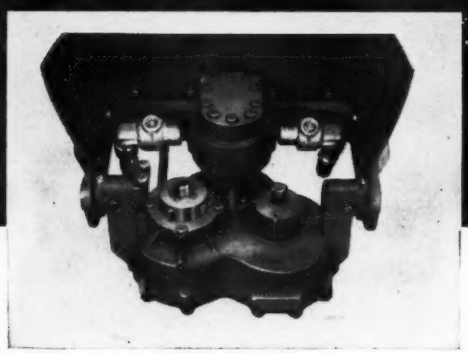
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PHONE COurt 1-0750

IT'S AN EFFICIENT WORKER

this 56-RDR roof drilling machine



Unit has M.S.A. dust collecting system. Trolley pole type arm holds dust collector in position against the roof. Note tanks mounted on machine.



Closeup shows twin drives for drilling and roof bolt tightening.

Tightening a roof bolt to secure the roof. Whether drilling or bolting, controls are easy-to-reach.



One unique feature which makes this Jeffrey unit efficient is the twin drive on the boom. One drive provides for high speed drilling; a second drive furnishes the right torque for tightening roof bolts. Each drive is designed specifically for its job.

The Jeffrey 56-RDR is efficient, too, because of its long reach. The drill arm swings 10′ 9½″ right or left of center. More holes can be drilled with fewer moves.

Another efficiency feature is the controls which are located on the boom within easy reach of the operator. Included is a slow tram speed control which permits "inching" when spotting holes.

For more information, write to The Jeffrey Manufacturing Company, Columbus 16, Ohio.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT
TRANSMISSION MACHINERY • CONTRACT MANUFACTURING



Why a yielding arch is superior to rigid roof support

In moving ground, no rigid support, however big or of whatever material, can indefinitely withstand the dynamic pressures caused by the weight and subsidence of overburden. In fact, the more rigid the support the more it may aggravate the condition. That's because a rigid support does not distribute the loads uniformly, thus preventing a pressure zone from forming around the mine opening.

But an arch that will yield, such as the Bethlehem Yieldable Arch, allows the overburden to settle slowly forming its own natural arch, which in turn carries the major portion of the load. As the Bethlehem Arch yields, the stress is absorbed by the rock itself until equilibrium is reached.

Thus it is not the strength alone but the "give" of the Yieldable Arch that holds a tunnel or drift open. This yieldable feature comes from nesting the segments of an arch set one into the other so that they overlap. The U-bolt clamps that hold the overlapping segments together are drawn tight enough to create the right amount of friction. When the load becomes excessive it overcomes the friction sufficiently to make the segments slide, equalizing the pressure.

Each arch set is tied to its neighbor by horizontal steel struts attached with J-bolts to maintain proper spacing and lateral stability. Two spacer lugs are welded to the flanges at each joint to keep the U-clamps correctly spaced and provide more uniform frictional resistance. A Bethlehem engineer will be glad to consult with you on the application of Yieldable Arches to your mine. You can reach him through any Bethlehem sales office.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation.
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BETHLEHEM STEEL

ALLIS-CHALMERS

new TS-260



power-matched for production

power-matched to capacity With more than 18 horsepower for every yard of struck capacity, the new TS-260 has plenty of power to move full loads at full speed—under all conditions.

power-matched to strength The TS-260 has the structural strength and balance to effectively utilize all of its horsepower . . . with extra capacity built into the clutch, transmission, final drives and drive axles . . . with a heavy, all-steel, box-type tractor frame . . . and with proper over-all weight distribution.

Motor Scraper



200 hp
11 yd (struck)
14 yd (heaped)

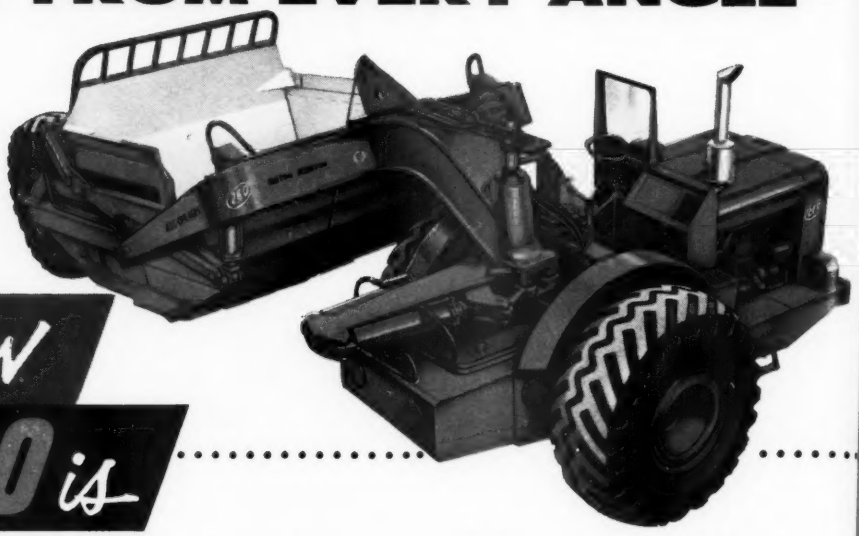
and profit on the job!

***power-matched* for speed** The big Allis-Chalmers diesel engine provides high torque at both high and low engine speeds resulting in smooth shifting and fast acceleration. And with plenty of engine power, the TS-260 loads fast, hauls fast, dumps fast . . . moves big payloads at low cost, even under tough conditions.

***power-matched* for operating ease** Overlapping gear speeds in all four gear ratios reduce gear shifting, speed work cycles. And with 90-degree steering for rapid maneuvering in close quarters, it's easy for the operator to get the most out of the TS-260.

The new TS-260 gives you these four basic advantages . . . and many important new features

CHECK IT FROM EVERY ANGLE—



the New TS-260 is Designed for Low-Cost Dirt

"Live action" hydraulics for sure control. Positive gear-driven pump provides constant live power for both steering and scraper operation. Full-flow filtering, cross relief valves and simple design make this an efficient, safe performer.

Positive 90-degree steering for close-quarter maneuverability. The steering wheel is direct-link connected to the steering valve. A 30-degree turn of steering wheel directs full pump flow to two double-acting steering jacks for fast, positive turns up to 90 degrees. For slower turning at high speeds, a slight turn of steering wheel provides a smooth, regulated response.

Double-safety brakes for positive stops. Big, four-wheel air brakes provide sure braking under full load at full speed . . . and an air reservoir system with emergency relay valve means positive braking safety.

"Boiling-action" loading for big payloads. Combination of curved bowl bottom and offset cutting edge provides a "boiling" action that eliminates voids . . . builds profitable, heaped loads.

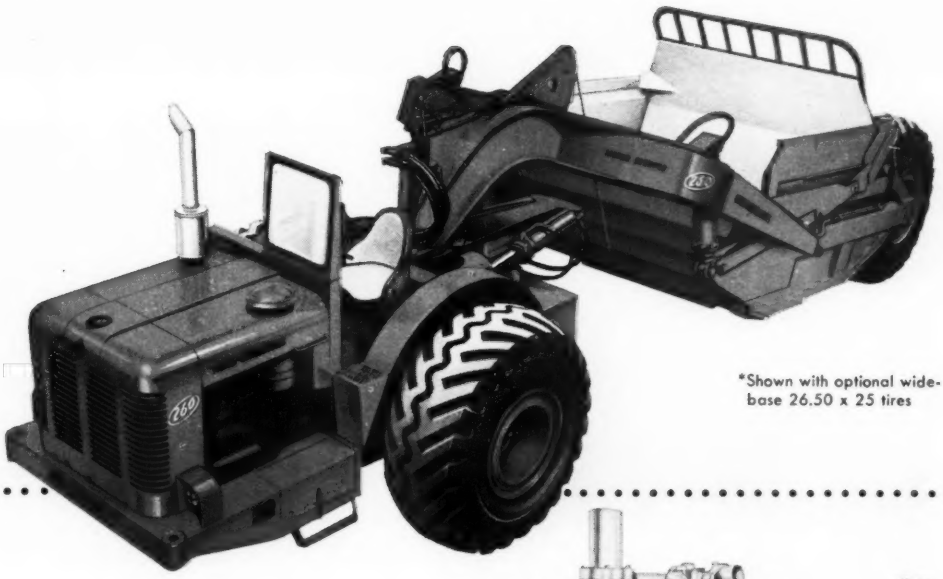
Quick, clean spreading with high apron and forced ejection. Patented linkage moves apron ahead and up when ejector goes forward . . . providing high apron lift and exceptionally large opening for clean, easy-to-control unloading.

Balanced weight distribution for maximum traction, long tire life. When empty, 66 percent of entire TS-260 weight is on front wheels—34 percent on rear wheels. When loaded, each wheel supports equal weight—providing excellent flotation and fast hauling.



Get all the Facts . . . NOW!

See your Allis-Chalmers dealer for full details on the new TS-260. Find out how this new motor scraper is *power-matched* for production and profit on the job.

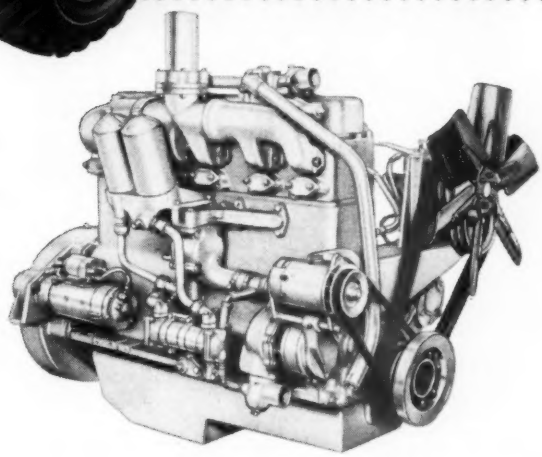


*Shown with optional wide-base 26.50 x 25 tires

Choice of tires to fit job conditions*. Standard 21.00 x 25 (20-ply) or optional wide base 26.50 x 25 (20-ply) tires provide a choice that insures carrying capacity and full flotation for steady going in all types of material.

Big 200-horsepower Allis-Chalmers diesel engine. The 844-cubic-inch piston displacement and conservative 200-horsepower rating of this outstanding diesel engine provides plenty of reserve for low-cost operation under all conditions. "Follow-through" combustion results in sustained power, low peak pressures . . . smooth, steady performance.

New easy-shifting transmission. There's a correct gear ratio in the TS-260 transmission for every speed, every work condition. New clutch brake and gear overlap in all four speeds makes it easy to shift gears smoothly, maintain steady acceleration and full pulling power.



Heavy-duty power train. The TS-260 power train is designed to transmit high engine torque to the drive wheels with maximum efficiency. The engine, clutch and constant-mesh transmission are assembled as a unit to assure accurate alignment. Simplified removal of each individual component provides easy serviceability.

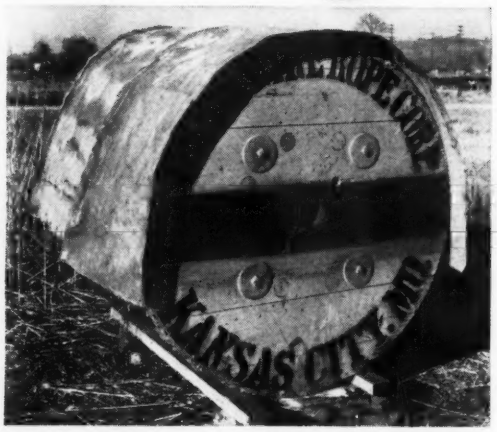
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A-C ALLIS-CHALMERS

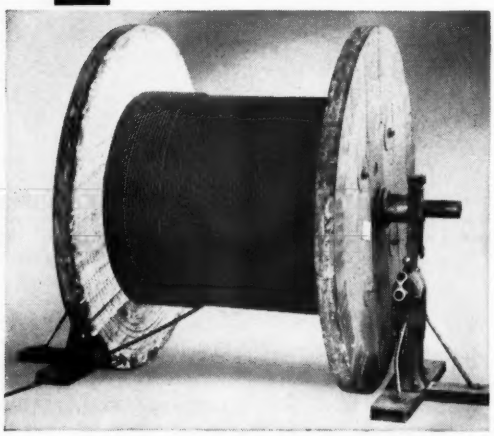
ALLIS-CHALMERS

Tuffy® Tips



Store Rope Like This

Keep spare rope in a dry, sheltered place free of dust, vapors or fume-laden air. If stored out of doors, set reel on blocks off the ground. Clear away weeds and grass and protect with a waterproof covering as shown. Check each month for rust caused by moisture collecting on the rope. Paint with a heavy crankcase or cylinder oil if rust is discovered or even before it shows up if moisture is present.



Unwind Like This

When getting ready to install the rope, special care should be taken to see that the reel is set up for smooth, easy unreeling. Set reel up on jacks as shown above and unreel so the rope pulls off from the bottom of the reel—*not* from the top. Coils should be put on a swift or rolled on the ground to pay off the rope. Kinks or "doglegs" may result from incorrect unreeling, seriously damaging wires of the rope and greatly reducing the ultimate life.

Research Adds Factual Data On Sheave Sizes

Until recently determination of sheave sizes has been by rule of thumb, experience and meager factual data. The influence of variables in operating conditions on rope life must still be determined by experience.

Insofar as bending stresses alone would be the primary cause of rope failure, exhaustive bending tests have established factual data giving a better guide than the former fixed sheave diameter and construction ratio tables.

These tests were conducted under the auspices of the Wire Rope Technical Board and the American Petroleum Institute.

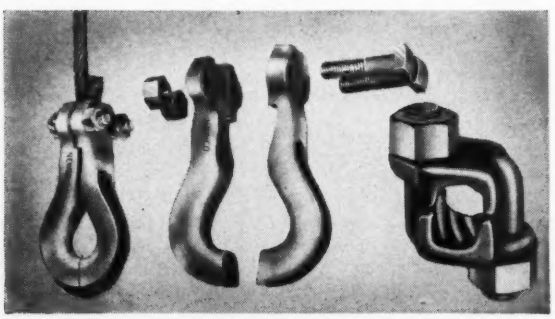
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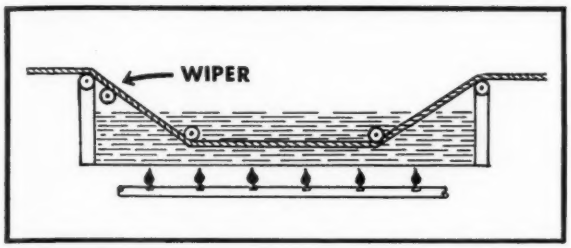
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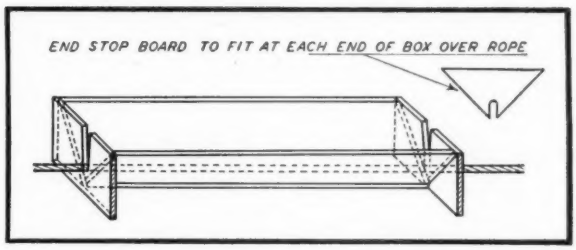


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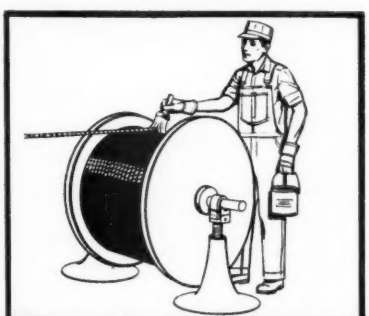


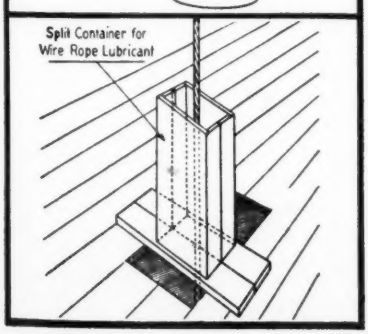


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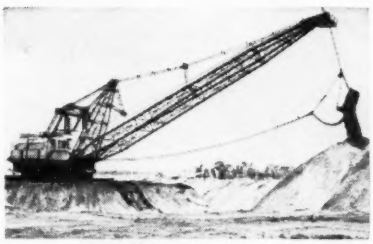
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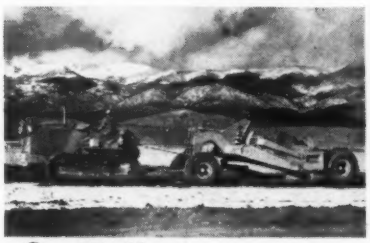
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Has an inside flexibility for easier casting and better spooling and enlarged outside wearing surface to take more abrasive wear.



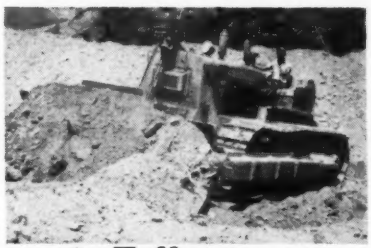
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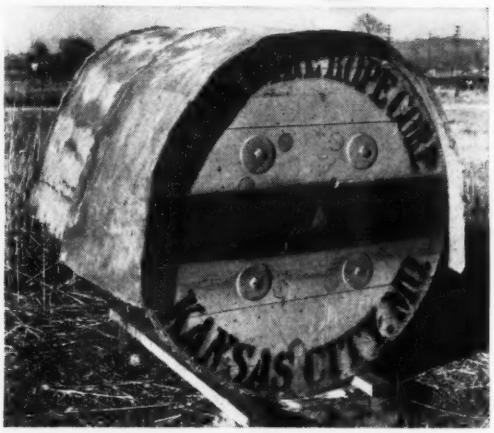
union *Wire Rope* **corp.**

2144 Manchester Avenue, Kansas City 26, Mo.

3

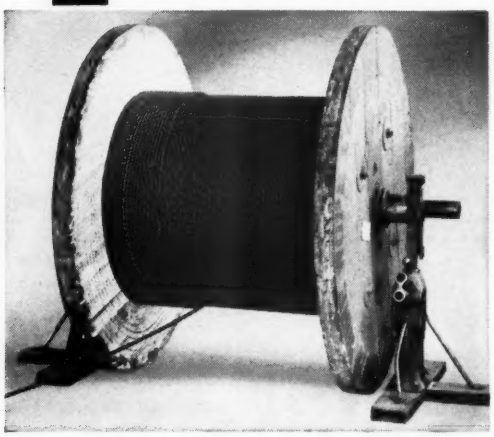
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Tuffy® Tips



Store Rope Like This

Keep spare rope in a dry, sheltered place free of dust, vapors or fume-laden air. If stored out of doors, set reel on blocks off the ground. Clear away weeds and grass and protect with a waterproof covering as shown. Check each month for rust caused by moisture collecting on the rope. Paint with a heavy crankcase or cylinder oil if rust is discovered or even before it shows up if moisture is present.



Unwind Like This

When getting ready to install the rope, special care should be taken to see that the reel is set up for smooth, easy unreeling. Set reel up on jacks as shown above and unreel so the rope pulls off from the bottom of the reel—*not* from the top. Coils should be put on a swift or rolled on the ground to pay off the rope. Kinks or "doglegs" may result from incorrect unreeling, seriously damaging wires of the rope and greatly reducing the ultimate life.

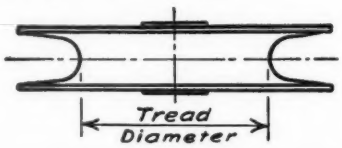
Research Adds Factual Data On Sheave Sizes

Until recently determination of sheave sizes has been by rule of thumb, experience and meager factual data. The influence of variables in operating conditions on rope life must still be determined by experience.

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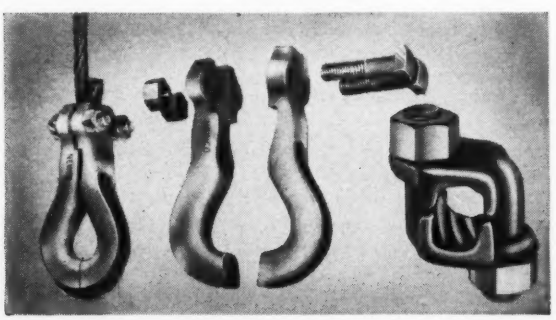
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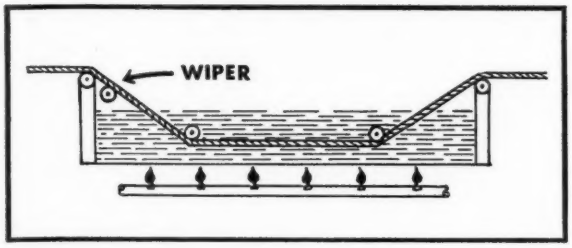
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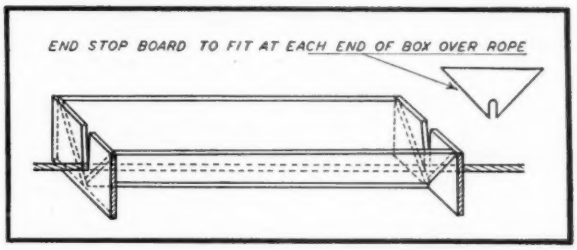


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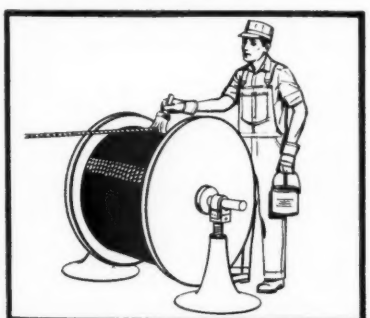


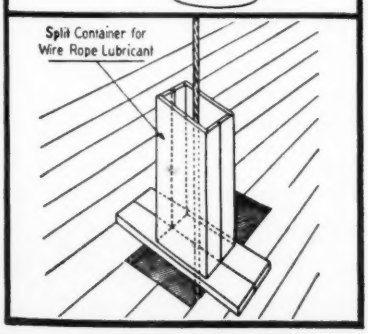


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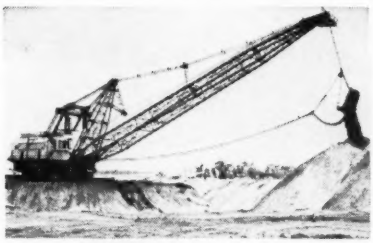
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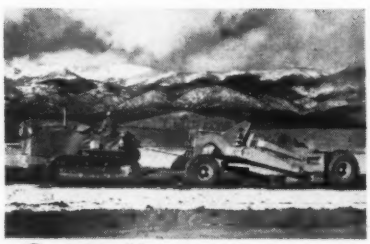
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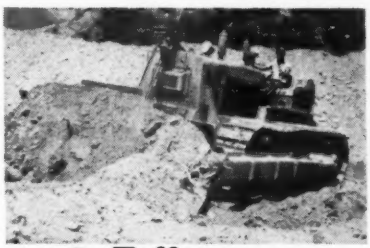
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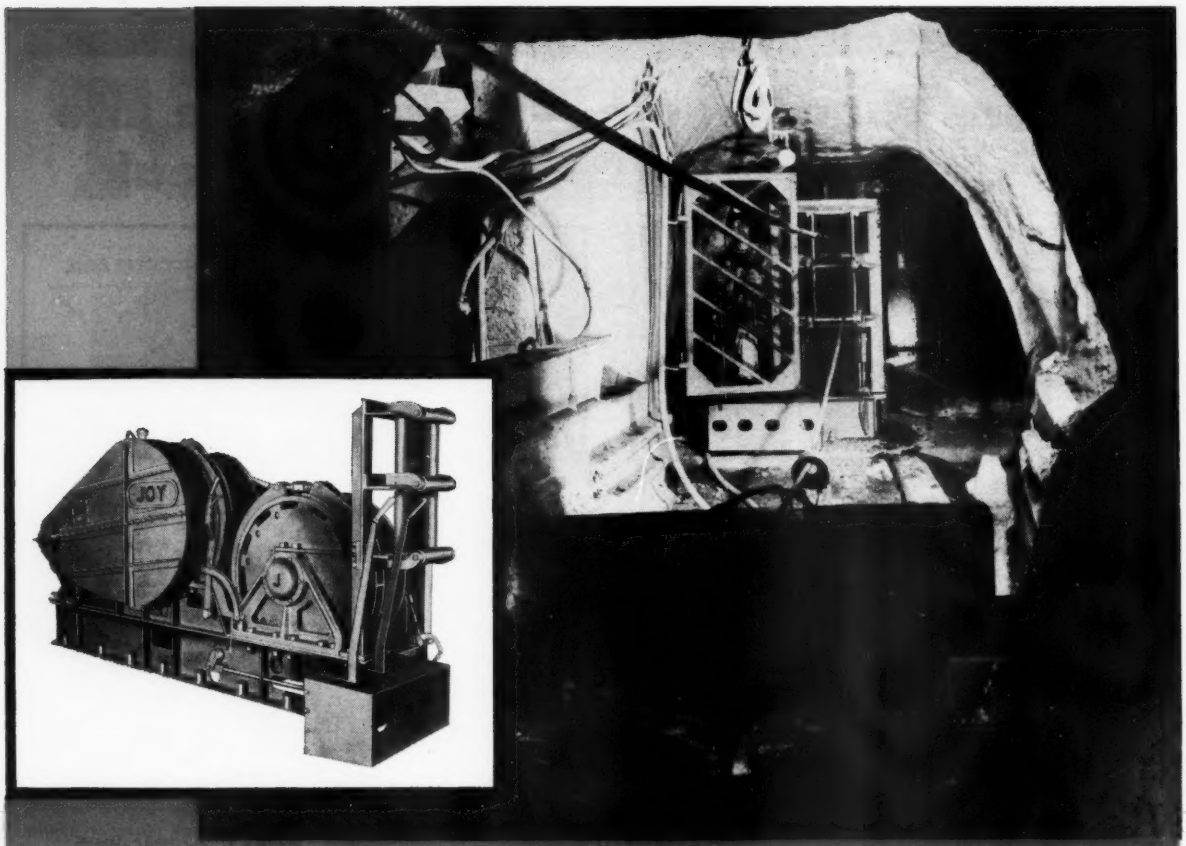
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Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand



BIG JOY EQUIPMENT is the PAYOFF at CLIMAX

A mining system built around the use of high-capacity, heavy-duty scraping equipment has been the payoff at Climax. Block caving into slusher drifts, which will accommodate a 6′ folding scraper, has resulted in a saving of up to half of the cost of gravity-chute ore collection methods previously employed.

The 150 HP Joy XT-221, a large tandem two-drum slusher with chain drive, is used at Climax for this high-capacity slusher operation. Many of these heavy-duty machines work on a three-shift basis yet with remarkably low maintenance. During the loading of the first 3 million tons of ore from the Storke Level at Climax by 23 Joy XT-221 Slushers, *the only repair charge was for clutch band linings.*

The Joy XT-221 is the largest model in a complete line of rugged scraping equipment expressly built for heavy underground duty. The line ranges from the 5 HP Model S-221 to 150 HP units such as the one illustrated above in a Climax drift, and includes models which will solve most scraping problems. For complete information on Joy Slushers, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



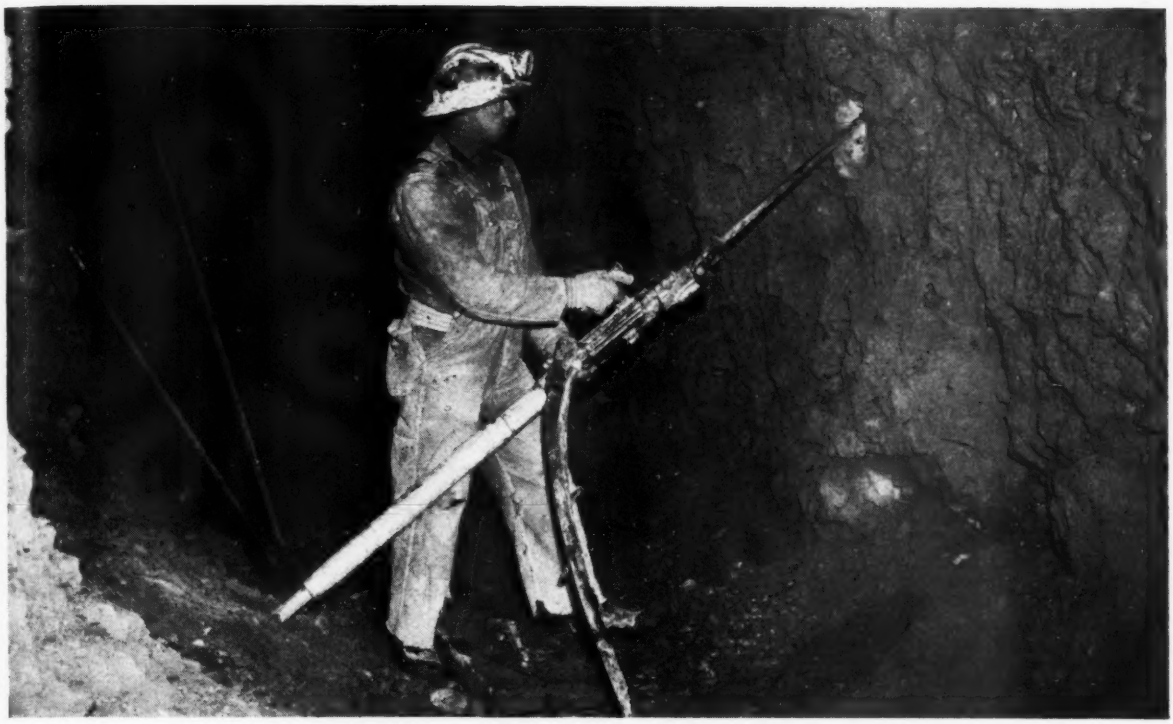
Write for FREE Bulletin 66-3

Consult a Joy Engineer

for AIR COMPRESSORS, ROCK DRILLS, CORE DRILLS, HOISTS and SLUSHERS, MINE FANS and BLOWERS WSW M 5737-66

JOY

WORLD'S LARGEST MANUFACTURER OF UNDERGROUND MINING EQUIPMENT



New Stoper Drill Design Combines 30% Reduction in Weight with 10% Faster Drilling Speed

Use of modern materials in new Le Roi-Cleveland S-10 Stoper results in easier handling.

With the introduction of the new Le Roi-Cleveland S-10 Stoper, great strides have been made in easing the work-load of miners. At the same time, their productivity, in terms of footage drilled per shift, has been increased.

New stoper uses aluminum feed leg to help decrease weight as much as 30% and provide better balance. This type of feed leg, already so successful on Le Roi-Cleveland Air Legs, contributes greatly to weight reduction: The S-10 with 18-inch steel change weighs only 79 lbs!

10% faster drilling speed results from a combination of design features: The new valve is timed and ports are arranged so that a maximum flow of air is delivered to the piston on both downstroke and upstroke. Hard-hitting, rock-shattering blows result, along with a rotation that's strong enough to turn the steel in the worst kind of drilling.

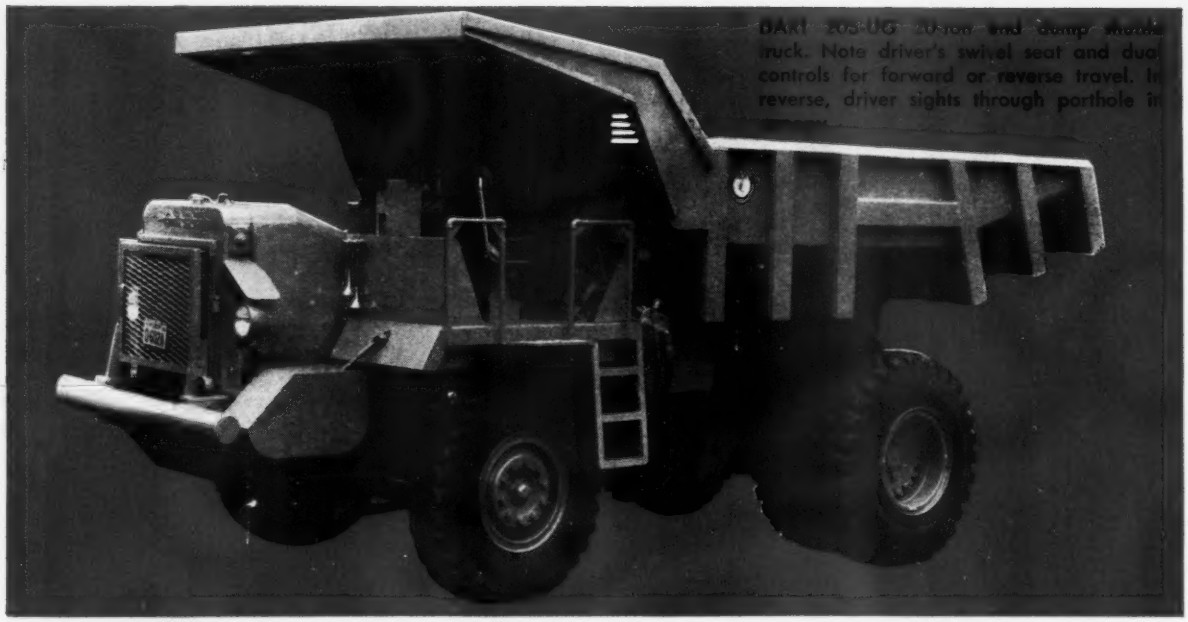
The variable feed-pressure control also adds greatly to the performance of the S-10. It has a wide enough range to feed the machine properly against all kinds of rock. Maximum drilling speed is attained. At the same time, both bit life and machine life are increased.

Exclusive steel puller permits the use of collared steel. This is of special advantage in tight ground, where stuck steels used to be a problem. The new steel puller, consisting of only 5 parts, also makes stoper operation safer. Since the steel never leaves the machine, the danger of falling drill steel is eliminated. The new S-10 Stoper is also available with tappet-type construction for shankless steel.

Three sizes of feeds are available. The S-10 can be supplied with 18, 24, and 30-inch steel changes for 7/8 and 1-inch hexagon or quarter-octagon steels, with or without collared shanks.

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

RD-83



DART 205-UG 20-ton end dump shuttle truck. Note driver's swivel seat and dual controls for forward or reverse travel. In reverse, driver sights through porthole in

OIL from ROCKS VIA 4 DART TRUCKS

For use in its experimental shale oil plant at Rifle, Colorado, the U. S. Bureau of Mines recently put to work four custom-built DART Trucks. The shale mines are underground and the trucks are specially designed to negotiate sharp corners and close quarters. The trucks are driven into the mine backwards and after loading, driven out in forward gear. Then there's a long road-haul to the processing plant. Unusual performance is required. The trucks are powered by 225 HP Diesel engines with Twin-Disc Torque Converters and Fuller 4-speed transmissions. The rock-type body, with removable cab protector, has a capacity of 15 cubic yards.



172,400 pounds of DART Trucks lined up to carry more than 80 tons of oil-bearing shale. With a wheelbase of 126", the trucks turn in a radius of 28'.



Ease of handling the big trucks is a boon to the operators. Hydraulic steering, air brakes and dual controls for shuttling eases the job, adds safety.



Up goes 20 tons! Twin 7½" diameter double acting, two-stage Hydreco hydraulic hoists provide fast and positive dumping.

DART TONNAGE ENGINEERED TRUCKS

Kansas City 8, Missouri

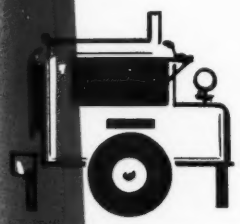
D-116

SUBSIDIARY OF THE CARLISLE CORPORATION

Got a tough job?

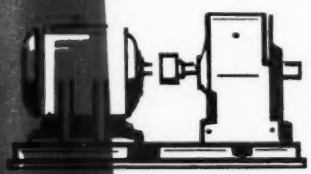
Give it to STANOIL Industrial Oil

This oil gives superior lubrication to a long list of mine equipment—here are three big jobs it can do—



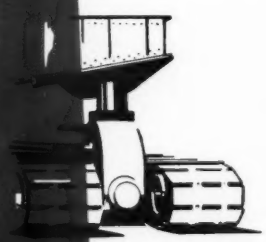
COMPRESSOR

High oxidation stability and low carbon-forming characteristics of STANOIL virtually eliminate the danger of carbon deposits on valves. STANOIL separates readily from water. There is no problem of emulsion in compressor crankcase.



SPEED REDUCER

There are many years between maintenance jobs on speed reducers when STANOIL is the lubricant. Herringbone gears remain clean and free of wear. Low pour point of STANOIL gives oil ability to flow freely from a cold start. No trouble either in prolonged, high temperature operation.



HYDRAULIC JACKS

Tough mine hydraulic service is the ideal place for STANOIL. High viscosity index and low pour point of STANOIL assure smooth operation no matter what the temperature. STANOIL resists contamination, will not emulsify.

Pick your tough lubrication jobs, give them to STANOIL Industrial Oil and get the results you have wanted. Find out more. Call your Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest and Rocky Mountain states. He is experienced in mine lubrication. Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

Quick Facts About

STANOIL Industrial Oil

- **Stability**—STANOIL's antioxidant gives oil resistance to chemical change, minimizes deposits.
- **Rust Prevention**—Inhibitor in STANOIL "plates out" on metal surfaces, prevents corrosion.
- **Cold Starts**—STANOIL has low pour point. Flows freely from cold start. No need for costly warm-ups.
- **Resists Effects of Temperature Change**—STANOIL has high viscosity index, is resistant to temperature change.
- **Has Excellent Demulsibility**—STANOIL is refined to eliminate emulsion problems, contains additive to minimize foaming.

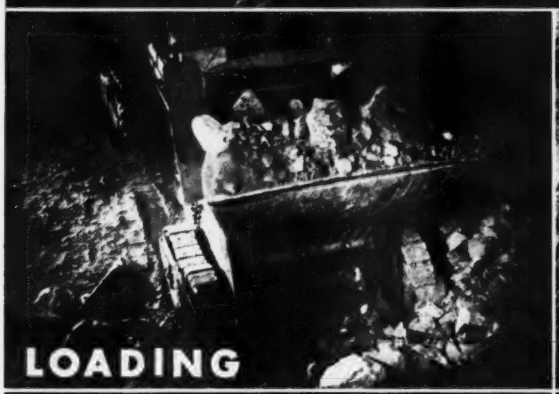
STANDARD OIL COMPANY
(Indiana)

STANDARD

About the Gismo



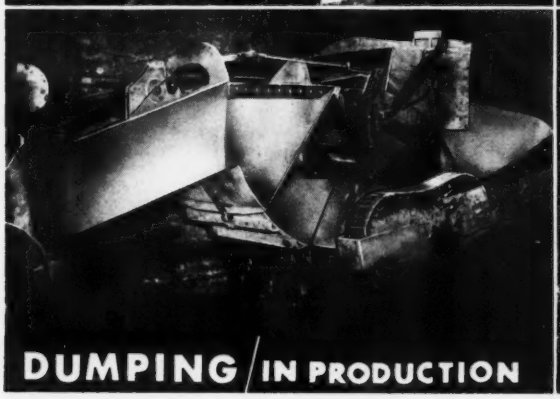
GISMO TRAMMING



LOADING



DRILLING



DUMPING / IN PRODUCTION



DUMPING / IN S-D CARS IN DEVELOPME

equipment— what are the facts?

It is our opinion that mining equipment manufacturers have never before offered the industry such a wide selection of equipment as you will see at this year's Metal Mining Show, Oct. 1-4 at Los Angeles. Unquestionably, tomorrow's production economies and records in profitable mining operations will be the direct result of management's selection of proper equipment . . . equipment around which a simple production method can be devised. And certainly the major prerequisite to maximum simplicity is minimum equipment, minimum labor with maximum production of both. A plan conceived and organized by management around the criterion simplicity becomes increasingly efficient.

We believe the use of the Gismo equipment offers management the logical opportunity of devising a simple production plan. Quite successful systems organized and built around the Gismo have not only resulted in great economy in use of labor and equipment, but have practically eliminated deficiencies of time cycling operation.

Three men with one Gismo Self-Loading Transport, one Gismo equipped as a 4-drill stoping jumbo and a Gismo tractor have produced over a long period of time in excess of 400 tons per shift. These 3 men and 3 pieces of equipment replaced 23 men using 13 separate slusher machines and 5 separate rock drill assemblies.

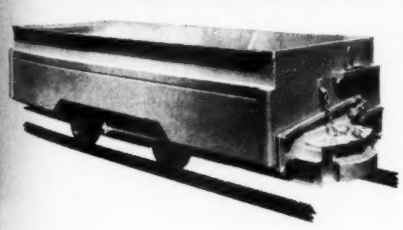
Much less stoping space was required by the Gismo method. The simplicity of the operation together with the greatly reduced manpower made it possible for supervision to practically eliminate the problem of close coordination and time cycling between the various departments of the mine such as drilling, blasting, loading, transportation, hoisting and general services.

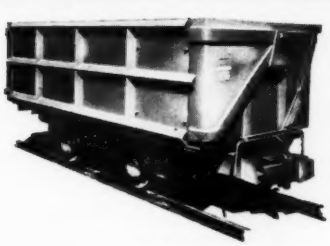
We realize producing such tonnage for so few dollars is a tremendous step forward. The natural reaction is to believe you are reading fantastic figures and statements. Nevertheless, all these facts are very true and they could mean but one thing. With the use of the Gismo equipment you are now free to organize the simple production method you have always strived for but have not been allowed to obtain because equipment permitting simple systems to function has not been available until now.

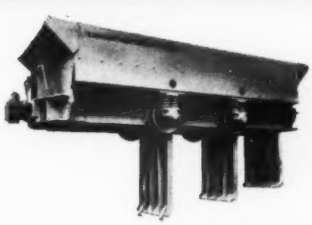
We invite you to visit us at our Exposition Booth 701, outside the Shrine Exposition Hall, and discuss this remarkable equipment with us during the Metal Show. If you are unable to attend, write us now for complete information. Sanford-Day Iron Works, Inc., Knoxville, Tenn., U.S.A.

SANFORD-DAY

"SUPER MARKET FOR MINE CARS"—all types • PRECISION WHEELS
BROWNIE HOISTS, CAR RETARDERS, SPOTTERS • THE NEW GISMO









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...are many years of valuable experience in meeting the exacting requirements of the coal industry for explosives and detonating equipment. You can rely on AMERICAN for precision performance and efficient cooperation in solving any unusual blasting problems. Fast delivery is assured by conveniently located plants and magazines.

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High Explosives	Electric Blasting Caps
Permissibles	Instantaneous
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Blasting Caps	Split-Second Delay

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If it's AMERICAN, it's dependable!

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Why NATIONAL TRADE-MARK *brushes are best for*

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Each Brush in the complete line of "National" brushes is compounded to meet a specific set of operating conditions. Together, these service-proved "National" brush grades provide a proper choice for every application in your mill or mine.

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GRADES AX-5, TA-35, TA-45 and 401

These are standard grades with long service-records; application is in accordance with machine design.

GRADES 850 and N-4

Grade N-4 is highly efficient in handling alternate extremes of light and heavy loading; grade 850, for open-hearth ladle, soaking pit cranes and severe hoist conditions.

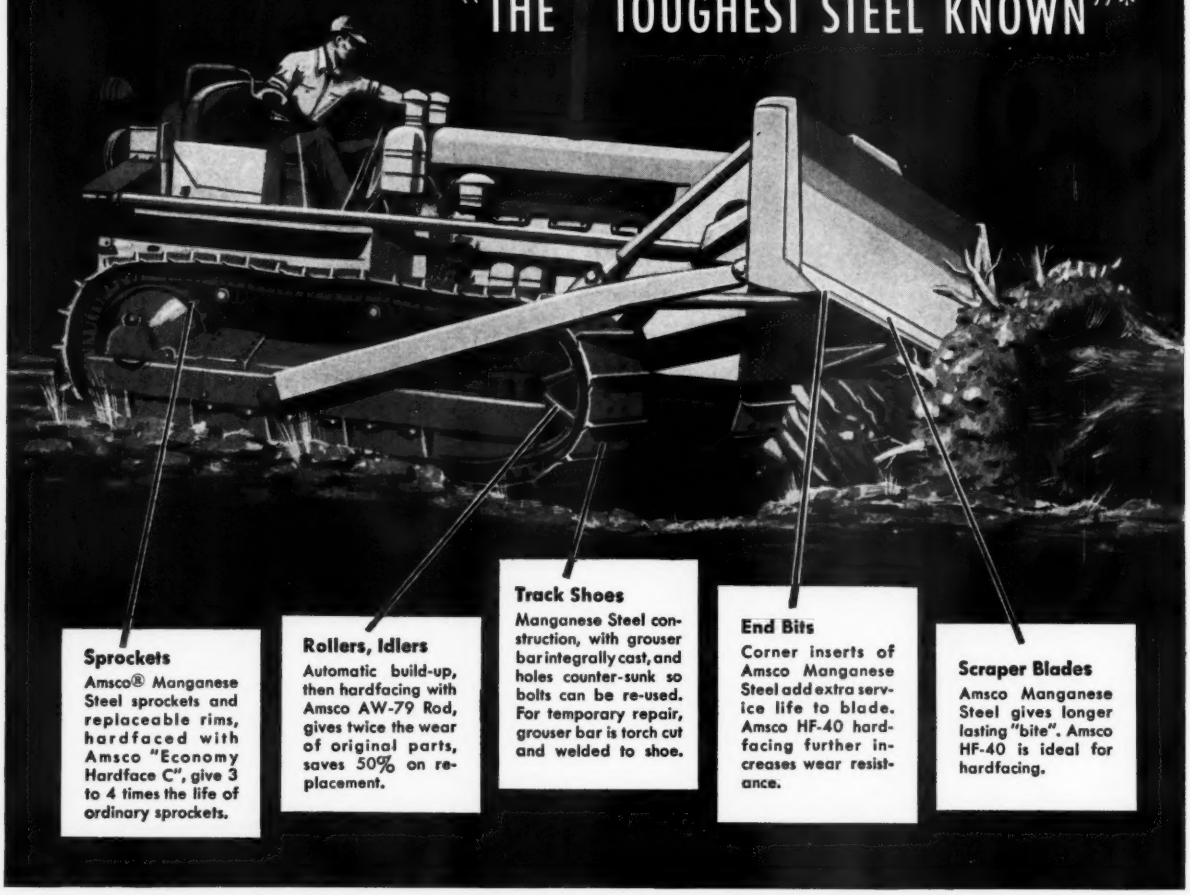
Be Certain of your brush selections. Get the recommendations of a "National" brush specialist to assure top performance and long life of costly equipment.

The term "National", the Three Pyramids Device and the Silver Colored Cable Strand are registered trade-marks of Union Carbide and Carbon Corporation

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At these TOUGH WEAR points, specify

"THE TOUGHEST STEEL KNOWN"*



Sprockets
Amsco® Manganese Steel sprockets and replaceable rims, hardfaced with Amsco "Economy Hardface C", give 3 to 4 times the life of ordinary sprockets.

Rollers, Idlers
Automatic build-up, then hardfacing with Amsco AW-79 Rod, gives twice the wear of original parts, saves 50% on replacement.

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Manganese Steel construction, with grouser bar integrally cast, and holes counter-sunk so bolts can be re-used. For temporary repair, grouser bar is torch cut and welded to shoe.

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Corner inserts of Amsco Manganese Steel add extra service life to blade. Amsco HF-40 hardfacing further increases wear resistance.

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Amsco Manganese Steel gives longer lasting "bite". Amsco HF-40 is ideal for hardfacing.

*AMSCO MANGANESE STEEL . . . plus AMSCO HARDFACING

Shown above are just a few of the "tough wear" points where Amsco products can save you money. Whether for original parts, or for build-up and hardfacing, specify Amsco Manganese Steel and Amsco Hardfacing for maximum operating economy.

We'll be glad to give you full information on Amsco Tractor Parts, Hardfacing Materials or Automatic Welding Machines. Just call your nearby Amsco representative, or write us direct.

OTHER AMSCO PRODUCTS

DIGGING: backhoe buckets—dippers and parts—repointers—dragline bucket parts—dragline chain—sheaves—pinions.

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American Manganese Steel Division • Chicago Heights, Ill.

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5 "Euc" REAR-DUMPS

10 to 50 Ton Capacities

for CONSTRUCTION, MINE, QUARRY and INDUSTRIAL WORK

10-Ton

Model UD has 128 h.p. engine . . . 10-speed transmission . . . 36 m.p.h. loaded travel speed . . . spring mounted drive axle with 12.00 x 24 duals.



Euclid Rear-Dump hauling units for off-highway service are available in five sizes with capacities of 10, 15, 22, 34 and 50 tons. They have diesel engines of 128 to 600 total horsepower.

The simple rugged construction of "Eucs" pays off in long life and low maintenance cost. You get more work-ability because there's less down time for repairs. There are more Rear-Dump "Eucs" in service than all other makes of off-highway haulers combined.

Have your Euclid Dealer give you facts and figures on the complete line of Rear-Dumps and other Euclid equipment . . . you may find, as hundreds of owners have found, that ***Euclids are your best investment.***

EUCLID DIVISION, GENERAL MOTORS, Cleveland 17, Ohio

15-Ton

There are two 15-Ton models with 5-speed transmission and 14.00 x 24 tires. Model FD has 165 h.p. engine, and 10 cu. yd. body. Model R-15 has 218 h.p. engine, spring mounted drive axle, power steering and 10½ cu. yd. body. Quarry body is available for either model.



22-Ton



Model TD "Euc" is equipped with 300 h.p. engine, spring mounted drive axle with 18.00 x 25 duals, power steering and 15 yd. body. Available with Torqmatic Drive or 10-speed transmission. Standard or quarry body is available.

34-Ton

Model FFD has two engines providing a total of 400 or 436 h.p. to tandem drive axles through separate Torqmatic Drives. Dual tires are 16.00 x 25. Exhaust heated body has 24-yd. capacity.

50-Ton

Similar in design to the Model FFD "Euc", the 50-ton Twin-Power Model LLD has a total of 600 h.p. and an exhaust heated body with 32-yd. capacity. Tires are 18.00 x 33.

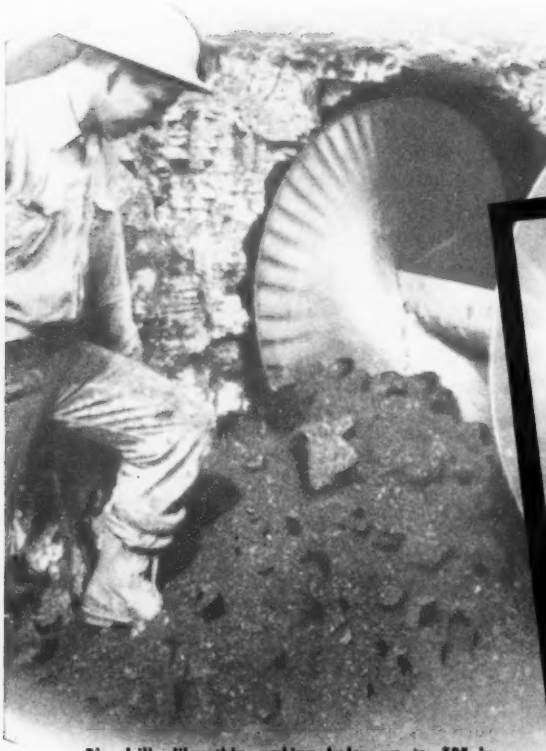
Euclid Equipment

FOR MOVING EARTH, ROCK, COAL AND ORE

EUCLID



New-Bigger -More Rugged



Big drills like this, making holes up to 50" in diameter and going back as far as required, bring out coal in smooth flow for mechanical loading.

Produces Up to 700 TONS A DAY from Holes Up to 50" in Diameter

Here, we believe, is the cheapest coal mining method yet developed, on a per-ton basis. Salvaging pure coal otherwise "lost" because of excessive overburden, the new CARDOX Model 235 can operate easily in any 26-foot pit —takes only a three man team. Because it is self-positioning by hydraulic jacks and self-moving, the No. 235 spends *more* time workin *less* time moving from hole to hole. Aug changes are quick and easy. With the Aug Miner spanning *two* holes, augers are stored the completed hole and recovered as need for the new hole being drilled. Its extrem rugged construction means less maintenan

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CARDOX AUGERMINER MODEL 235

for Lower Cost Continuous Surface Coal Mining



working while simple design makes such maintenance
e. Aug easier.
e Aug Get the full facts now on how the CARDOX
stored Model 235 AugerMiner may help you get the
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Phone: Boulder
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Phone: Library Colonial 3-6910

Camden-on-Gauley, W. Va.
Phone:
Camden-on-Gauley 2181

Evansville, Indiana
307 Northwest Fifth St.
Phone: Evansville 2-8944

Ottumwa, Iowa
Phone: Ottumwa
Murray 4-6564





This Headed Roof Bolt helps prevent roof falls

Roof falls, resulting in injury and loss of production, are less likely when you use roof bolting, with Bethlehem's square-head roof bolt. This method of roof support promotes safety because it anchors overlying rock. What's more, roof bolting offers these other worthwhile advantages: (1) improved ventilation, due to the absence of bulky supports, (2) increased production through greater freedom in operating mechanized equipment, and (3) less need for storage space, both above and below ground.

Used with Expansion Shell

The Bethlehem square-head roof bolt owes its positive locking action to the leaf-type malleable-iron shell with which it is used. When the bolt is tightened, the leaves of the shell expand, providing a firm four-way grip against the sides of the hole. A square roof plate provides additional support. A hardened washer, furnished with the assembly, reduces friction between the bolt head and roof-plate.

Bethlehem also manufactures a 1-in.-diam slotted roof bolt, used with a steel wedge. This bolt, because of its larger diameter, is ideal where maximum strength is required. It is also suitable for pillar bolting. When installed, the wedge is driven into the 6-in. forged slot, spreading the bolt-ends to fill the hole.

If you would like to consider a roof-bolting program, we suggest you would find it worthwhile to talk with a Bethlehem representative. Just get in touch with our nearest sales office.

TYPE	DIAM	TYPICAL BREAK LOAD, LB
Carbon	¾ in.	24,000
High-Strength	⅝ in.	24,000
High-Strength	⅞ in.	45,000

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
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BETHLEHEM STEEL

BETHLEHEM STEEL



"Maneuverable . . . that's why we bought it"

Angelo Tomasso, Inc.

hauls 1,200 tons of hard trap rock per day to a crusher in their quarry at New Britain, Connecticut. To an equipment fleet at this quarry that included a 2-yard shovel, a 15-ton Rear-Dump, and a 9-ton dump-truck, the company added a 22-ton C Tournapull Rear-Dump.

"We bought this machine in anticipation of working on a shelf. It is very narrow up there and we need to maneuver around...one false move and the machine would drop 90 feet," says A. Tomasso, Jr.

Maneuver safely on narrow roads

Tomasso and his crew soon found that Tournapull Rear-Dumps are well equipped to work safely on narrow shelves such as those encountered on this job.

Power steer makes the Tournapull easy and quick to maneuver. Prime-mover can turn 90° right or left for getting around in tight quarters.

In any emergency, Tournapulls' four-wheel multi-disc air brakes (with more braking surface on one wheel than most haulers have on all four) provide an extra bonus of safety. You can always depend on the Tournapull to stop instantly. Low center of gravity, good visibility, and front-wheel drive also contribute to Tournapulls' safety.

In the Tomasso quarry, rock crusher was located about 700 feet down 5% grade from the loading shovel. Rear-Dumps, hauling 18 tons of shot trap rock, traveled over the crushed rock haul-road in third gear, at speeds up to 11½ mph.

Comments Operator Albert Buchiere, "Trucks can't even get close to these machines. I've run about every type of haul unit there is and these 'Pulls are the best."

Cut lubrication time

Not only did the Tournapulls save time and money on hauling, but, according to Mr. Tomasso, it takes only ⅓ as long to lubricate the C Rear-Dump as it does to lubricate an ordinary dump-truck.

If you have hauling to do, over narrow roads or in close quarters, you will want more information on Tournapull Rear-Dumps' high production. Available in 11, 22, and 35-ton capacities, a size to fit your requirements. Write for full details.

Much of the material to be moved is trap rock, one of the hardest stones in New England. Three-layer, all-steel, grid-type bowl with tool-steel floor resists shocks of loading. Big, wide bowl opening with low rear entry, is an easy target for this 2-yard shovel.



After one of New England's disastrous hurricane-floods, this Tournapull Rear-Dump took Civil Defense officials on a survey of damage in the area. It was the only unit in the area that could safely drive through the high water. Tournapull also helped to haul 270,000 yards of borrow and gravel over average 3½-mile distances to replace 4½ miles of the road, between Unionville and Collinsville, Connecticut.



When job report was taken, Tournapull was dumping into a 42 x 40-inch hopper. A flick of a switch activates hoist motor. Body lifts quickly, swings behind rear wheels to dump clean over bank, or into grizzly. Streamlined bowl sheds material readily. Body can also be held in any desired position for spreading on the run.

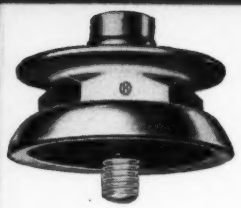
Tournapull—Trademark Reg. U.S. Pat. Off. R-966-Q-b

LeTourneau-WESTINGHOUSE Company, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

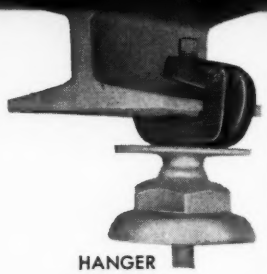
ARBA

See you at the ROAD SHOW • Chicago • January 28-February 2, 1957



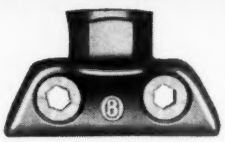
INSULATED HANGERS

1



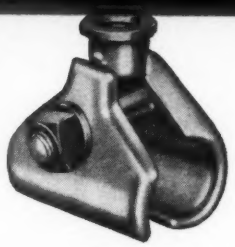
HANGER ADAPTERS

2



TROLLEY WIRE CLAMPS

3



FEEDER SLINGS

4



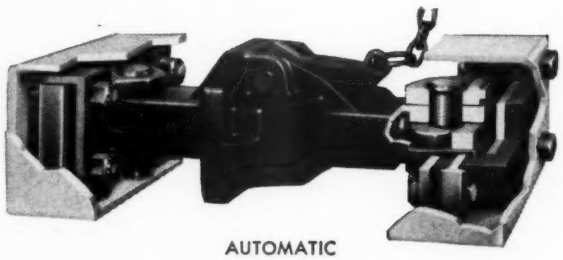
TROLLEY FROGS, CROSSOVERS

9



EXPANSION BOLTS

10



AUTOMATIC COUPLERS

11

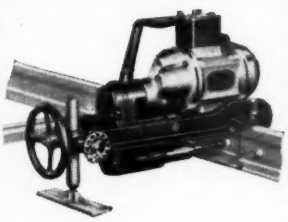
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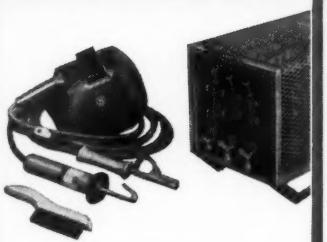
RAIL BONDS

12



RAIL DRILLS (for wedge bonding)

16



BOND WELDING EQUIPMENT

17



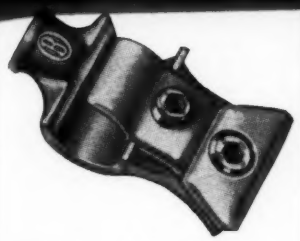
WHEEL COLLECTORS



TROLLEY WIRE CONDITIONING EQUIPMENT

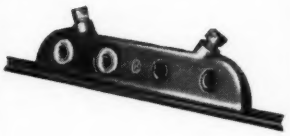


FUSED TAPS



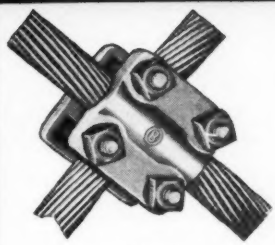
COMBINATION FEEDER-TROLLEY CLAMPS

5



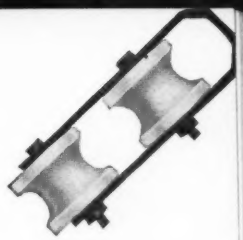
FEEDER AND TROLLEY SPLICERS

6

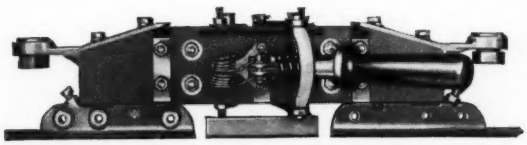


BRANCH CONNECTORS

7

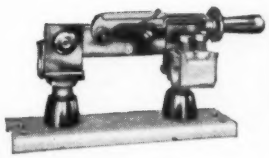


PORCELAIN INSULATORS



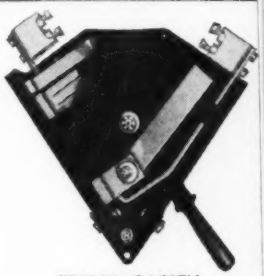
SECTION INSULATOR SWITCHES

12



QUICK-BREAK SWITCHES

13



FEEDER SAFETY SWITCHES
(cover removed)

Mine Haulage!

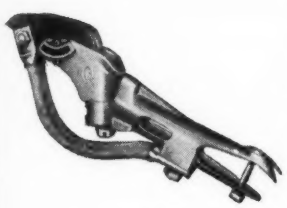
Ohio Brass is one of the world's largest suppliers of electrified mine haulage equipment — has been since before the turn of the century. That's why you can bring your mine haulage problem to O-B engineers and be sure of an efficient, economical solution—whether it's simply a recommendation for a new insulated hanger or a blueprint for a complete haulage system.

Use the handy coupon below to get the answers you're looking for.

AUTOMATIC COUPLERS

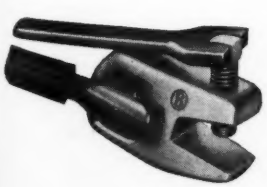
SAFETY AND

CONTROL EQUIPMENT



SHOE COLLECTORS

10



RAIL CLAMPS

Let O-B mining engineers help solve your mine haulage problems. Just circle the appropriate number and clip the coupon for information about these products and how to use them.

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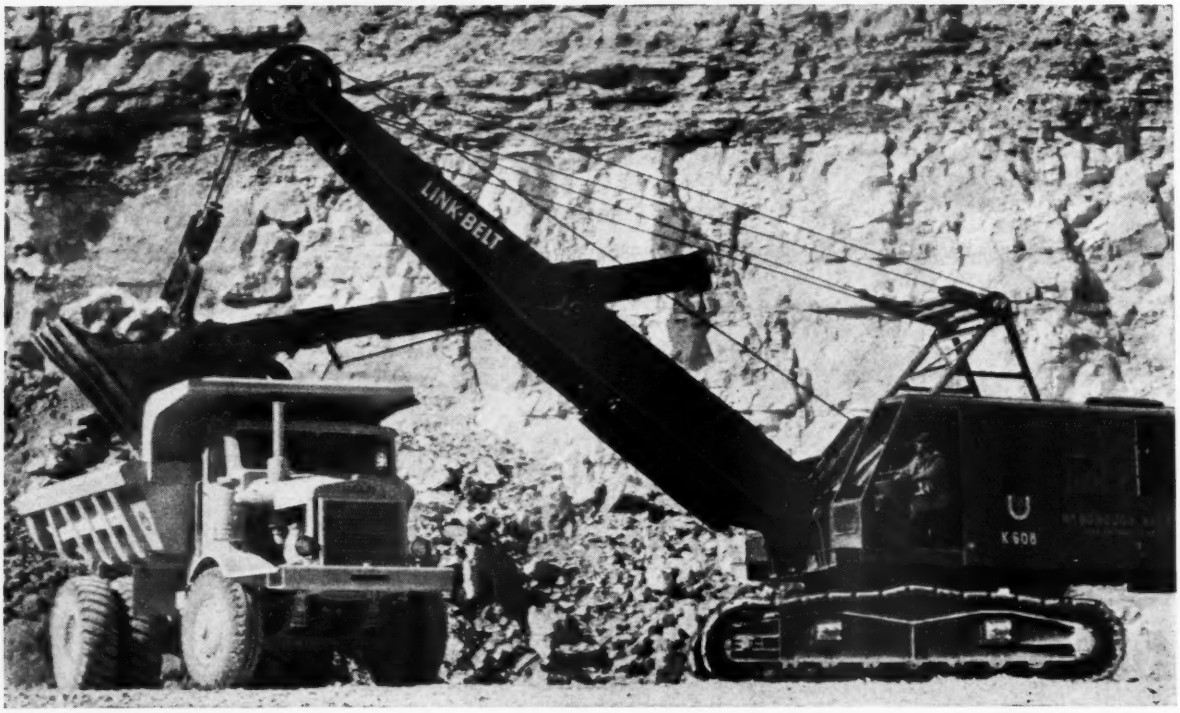
☐ **A Storehouse of Ideas** — O-B Mining and Industrial Catalog No. 27 is loaded with suggestions for more efficient haulage. Check the box to get your copy.

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4707-M

It's time to compare . . . with LINK-BELT SPEEDER



Now Link-Belt Speeder gives you "small rig" speed in a

new 3-yd shovel-crane

Here's the K-608 with true power hydraulic controls. It's faster . . . more agile and mobile . . . easier to handle than many machines half its size!

THE only machine in its class offering true power hydraulic controls—the K-608 responds quickly, precisely, positively to a touch of its operator's fingertip. It all but eliminates operator fatigue, boosts output by up to 25% or more!

Furthermore, the way a K-608's power follows the load is all but unbelievable. That's because a torque converter and tailshaft output governor (standard) automatically and perfectly match engine output power to the load. You get heaping dippers in a hurry, save needless wear on the power train, cut fuel costs.

And, the K-608 is precision-made of quality components with plenty of stamina to stand up under continuous use of great usable horsepower. It's designed to cut downtime, too. Clutches are hydraulic actuated, automatically compensate for heat and normal lining wear.

Every day you don't have a K-608 on the job is costing you substantial extra output. One look will convince you. So why not call your distributor right now. Ask him where you can see a K-608 at work. Link-Belt Speeder Corporation, Cedar Rapids, Iowa. 14,081

LINK-BELT SPEEDER

Builders of a complete line of crawler and rubber-tired shovel-cranes

CHECK THIS BRIEF LIST OF THE OUTSTANDING K-608 ADVANTAGES

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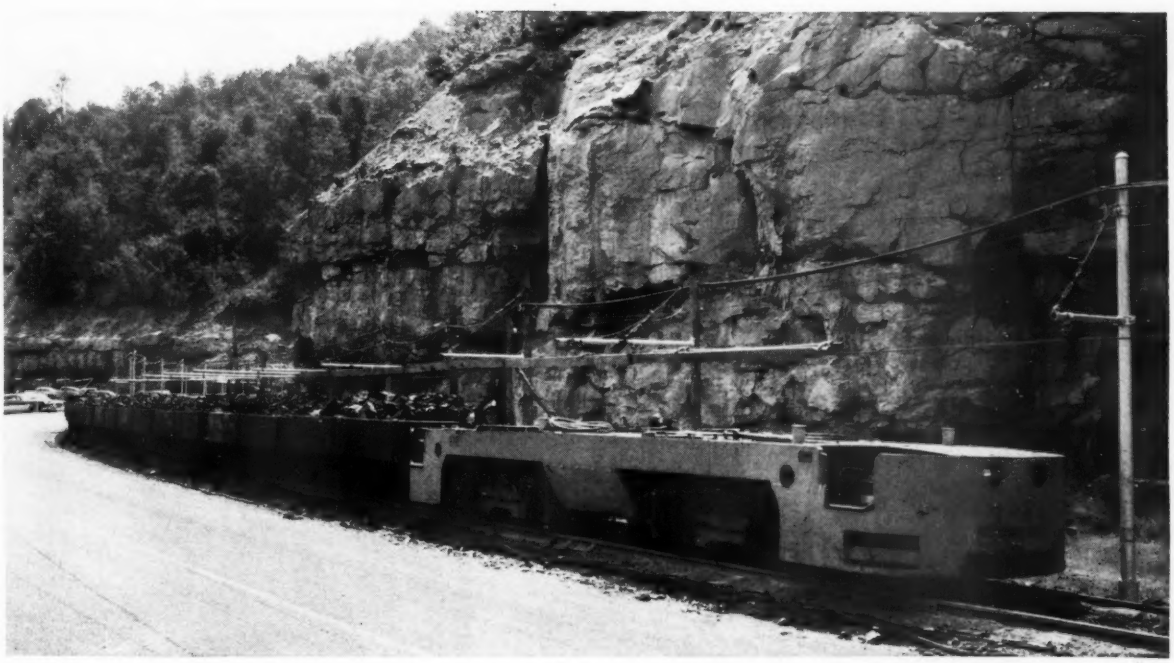
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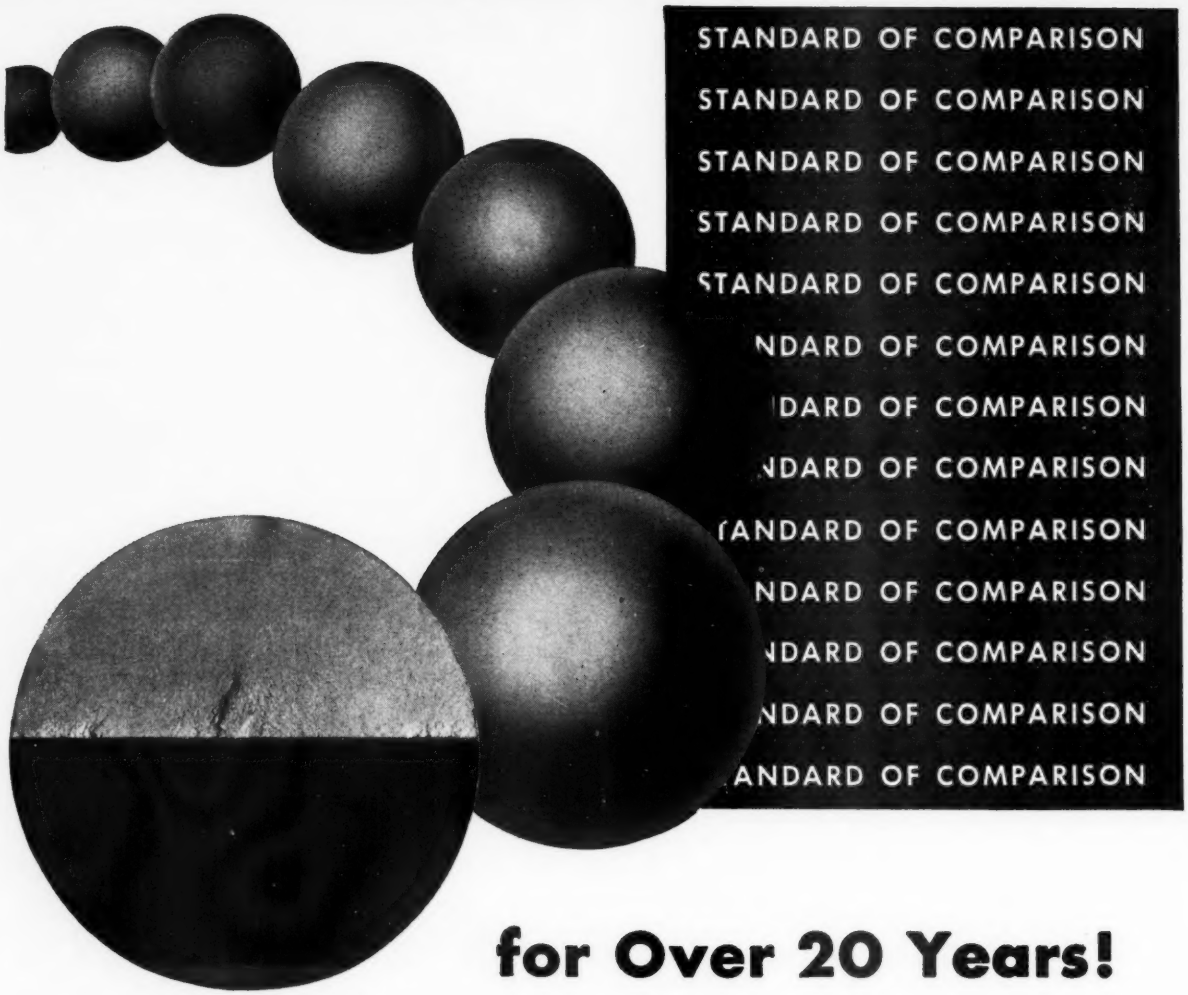
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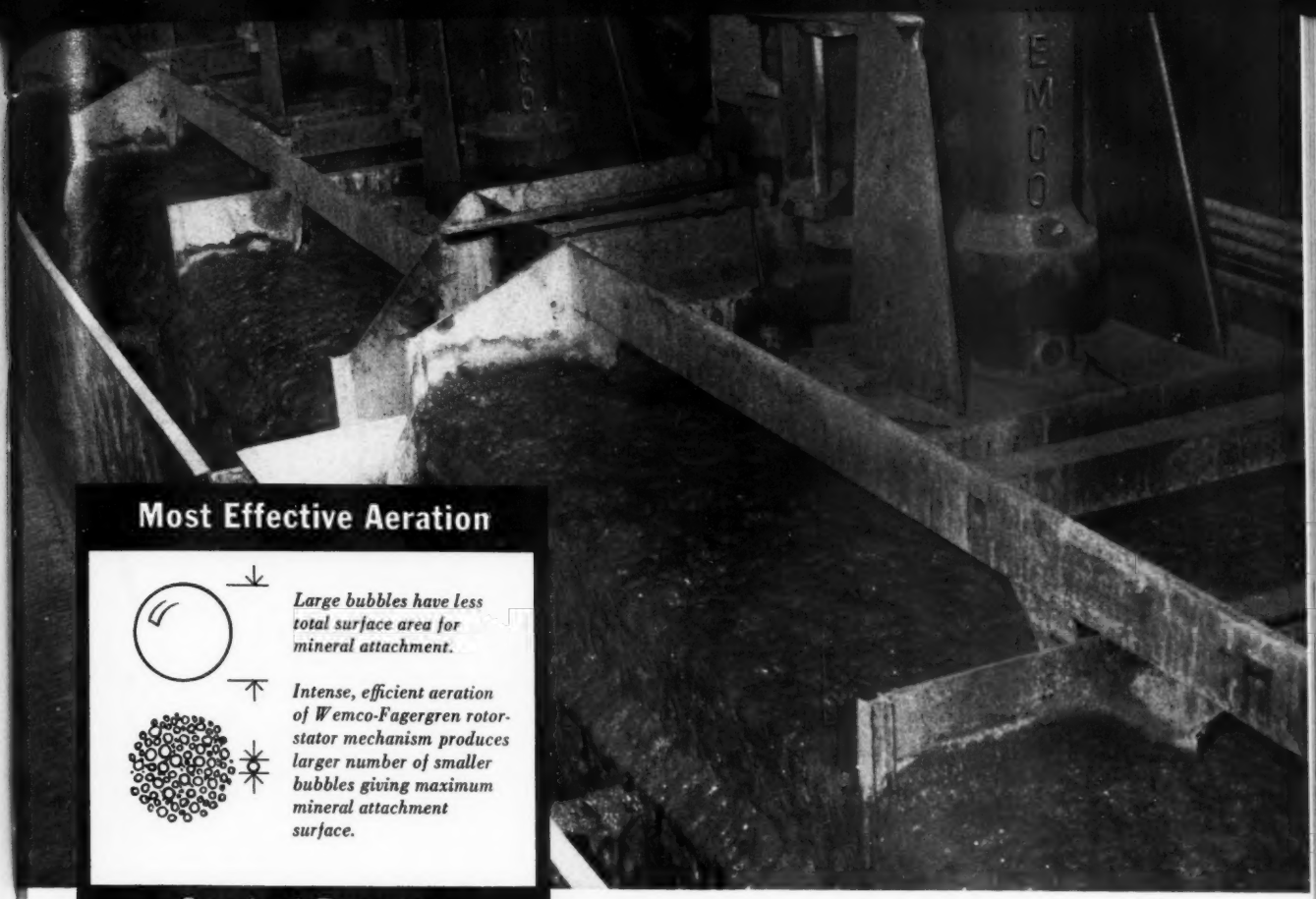
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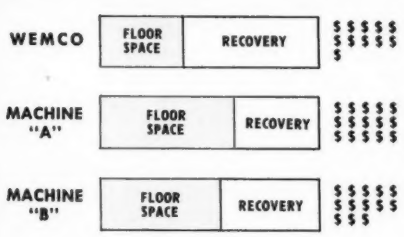


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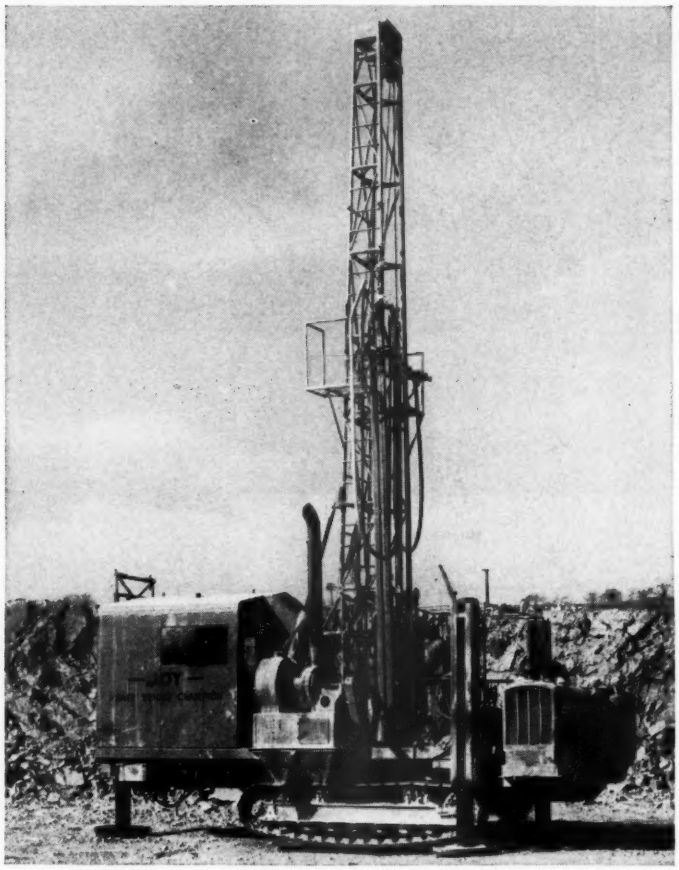
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Editorials

ROBERT W. VAN EVERA, *Editor*

AUGUST, 1956

Run in Circles

THE STEEL STRIKE is over and the outcome is another go-around in the inflationary spiral. The settlement was, as expected, a compromise. Unfortunately it cost the nation a month's steel production.

Industry can't be pleased to see the inflationary spiral perpetuated—since it means that new plants and equipment in the future will require greater capital investments. Steel companies are already concerned about the high cost of new plants, and there may come a day of reckoning when new capital will be more difficult to raise.

Labor groups have to "attack" to convince their membership that they are on the job, hence the strike which seemed so unnecessary. The burden of the steelworker's gain is borne by the whole national economy. The only bright spot in the picture is the fact that there is now in effect a three-year contract which may mean labor peace in the steel industry for that period.

Even Limburger Cheese

THOMAS A. EDISON, recognizing that wide variation is a basic factor of scientific experimentation, once summed up his theory in five words, "Try everything—even limburger cheese." To apply his theory the experimenter must necessarily be possessed with the ability to generate ideas, which may accurately be called creative power.

Methods of cultivating creative imagination are the subjects of extensive study by the Creative Education Foundation of Buffalo, N. Y. Alex F. Osborn of that organization, at a meeting sponsored by the Industrial Management Society, spoke on "Ways to Be More Creative" and said that, "Creative methodology usually includes some, or all, of the following procedures: (1) Orientation: Picking up and pointing up the problem. (2) Preparation: Gathering material relevant to the problem. (3) Analysis: Breaking down the relevant material. (4) Ideation: Thinking up tentative ideas by way of possible solutions. (5) Incubation: Letting up, in order to invite illumination. (6) Synthesis: Putting the pieces together. (7) Evaluation: Verifying the resultant solutions."

Osborn went on to say that in actual practice the exact sequence and conscious application of all these steps is not feasible. In discussing the importance of splitting a problem into its components he pointed out that this is not a creative function, but one of judgment and analysis which sets the stage for creative thinking. From this point on, judgment can be a hindrance and unhampered imagination should come into play.

Osborn points out that there are numerous ways to stimulate the imagination such as making notes, devising check lists, setting deadlines and quotas, making dates with ourselves for creative thinking, and self-interrogation.

Motivations that spur some men to creative thinking are hard to pin down. What gift did Benjamin Franklin possess to arrive at sage and logical conclusions through a process of thinking in unorthodox patterns? What the experts do know is that native creativity can easily be killed. You may remember the *Saturday Evening Post* cartoon of the staff meeting with the chairman saying, "All opposed will signify by saying, 'I resign.' "

There is still some question as to whether creativity can be taught, but we firmly believe that a manager or supervisor has the power to encourage it to fruition or to stop it in its tracks. Conformity has both advantages and limitations—we can become over-organized.

Group activities—or "brainstorming" panels—have proved valuable in some applications. These panels differ from an ordinary conference largely in that they prohibit all hampering influence such as criticism or even judicial evaluation.

Real progress comes about only through the coordination of two distinctly opposite types of thinking—the positive or creative approach on one hand and the judicial or logical, on the other.

We feel that mining, compared with the rest of American industry, owes a greater proportion of its success to creative thinking. At any rate the rewards for good new ideas are boundless and the fostering of creativity is well worth the sincere consideration of all of management.



The mining equipment at this West Virginian mine consists of 14 off-track conventional units and one continuous miner (similar to one pictured), producing 12,500 tons of coal per day

Pillar Mining Methods of Pocahontas Fuel

Limited Reserves of a Rich Coal Seam Make High Extraction a Decided Asset With This Coal Producer. Here is How Pocahontas Fuel Recovers As Much As 94 Percent of its Coal

By H. A. CASSELL
Division Superintendent
Pocahontas Fuel Co., Inc.

COAL in the Pocahontas coal field of southern West Virginia is of the medium low volatile rank, low in ash and sulphur, and has always been considered one of the best domestic and metallurgical coals in the world. Because of its high value and comparative scarcity, it has been considered, let us say, sacrilegious, to waste any of it; and every known method or practice must be used to recover as much of it as is economically possible. A high percentage of recovery is a *must*, and it has been the experience of The Pocahontas Fuel Co. that the highest percentage of recovery in the Pocahontas coal field is best obtained by the "open-end" method of pillar recovery.

During the period of hand loading operations, the practice of "open ending" was in general use in all company operations, and little if any difficulties were encountered. But with the advent of mechanical loading, many problems of a different nature arose to require solution. After numerous "trial and error" periods had elapsed, the method of pillar recovery now in general use in Pocahontas Fuel Co. mines evolved. The remainder of this article will describe the pillar recovery method as it is used at the Itmann mine.

The Itmann mine is located in Wyoming County, West Virginia, and is served by the Virginian Railroad. It is operating in the Pocahontas No. 3 coal seam which averages about 52 in. in thickness at this location.

The mine was initially opened during World War I and after being active for several years, operations were suspended temporarily until 1950. Operations have been continuous since 1950, and the mine is at the present time shipping about 12,500 tons of coal daily. In 1955 it ranked third among the nation's coal mines and was the largest coal producing mine in West Virginia.

Mining Equipment

Mining equipment consists of 14 off-track conventional units, and one continuous miner, operating a total of 40 unit-shifts daily. Conventional units consist of one 14-BU loading machine, one 11-RU mining machine

and two 6-SC shuttle cars. A Lee-Norse, Model 36X continuous mining machine, and two 6-SC shuttle cars are used in the one section where continuous mining operations are performed. The normal labor complement on conventional unit sections consists of 12 men, including the foreman; on the continuous mining section a crew of eight men, including the foreman, is being used at present.

The mine contains about 16 miles of mainline and storage tracks, including the loading loops. Motive equipment consists of three Westinghouse 20-ton mainline haulage locomotives, 10 GE 10-ton intermediate haulage locomotives, and 1100 solid-end mine cars of 5½-tons capacity. Transportation of personnel to and from the operating sections is provided by Lee-Norse portal-buses, and inspection jeeps.

Each operating section is provided with a separate ventilating air current induced by two Jeffrey aerodyne fans, producing approximately 350,000 cfm at a 2.5-in. water gauge.

Development Plan

The mine was opened by Long Branch Mains (four sets of four entries each) driven in a general southeasterly direction through the approximate center of the original lease, with two cross entries, Micajah and Pinnacle Mains (three sets of four entries each) driven in a southwesterly direction from the main entries to the outcrop or "want" area adjacent to Pinnacle Creek. At the present time, the mining is confined to the area bounded by the outby cross entries (Micajah) and the Deerfield Mine property line.

Mainline haulage enters the mine at the main driftmouth where nearby are located the combination mine office, lamphouse and waiting room; the repair shops, a sand-drying structure, and an oil-storage and distributing building. The explosives and detonator magazines are located around a bend and near the head of the hollow east of the driftmouth. The fans are located on either side of the hollow and the installations are protected against explosion forces by weak wall construction incorporated into the air ducts.

This discussion will be confined to the area bounded by the Pinnacle and Micajah Mains, and extending from Long Branch Mains to Pinnacle Creek—an area roughly 7500 ft long and 3000 ft wide, and containing approximately 3,900,000 tons of coal in place. With the exception of a narrow strip in one portion of this area, practically all the coal has been extracted, and a recovery figure of 94 percent has been obtained.

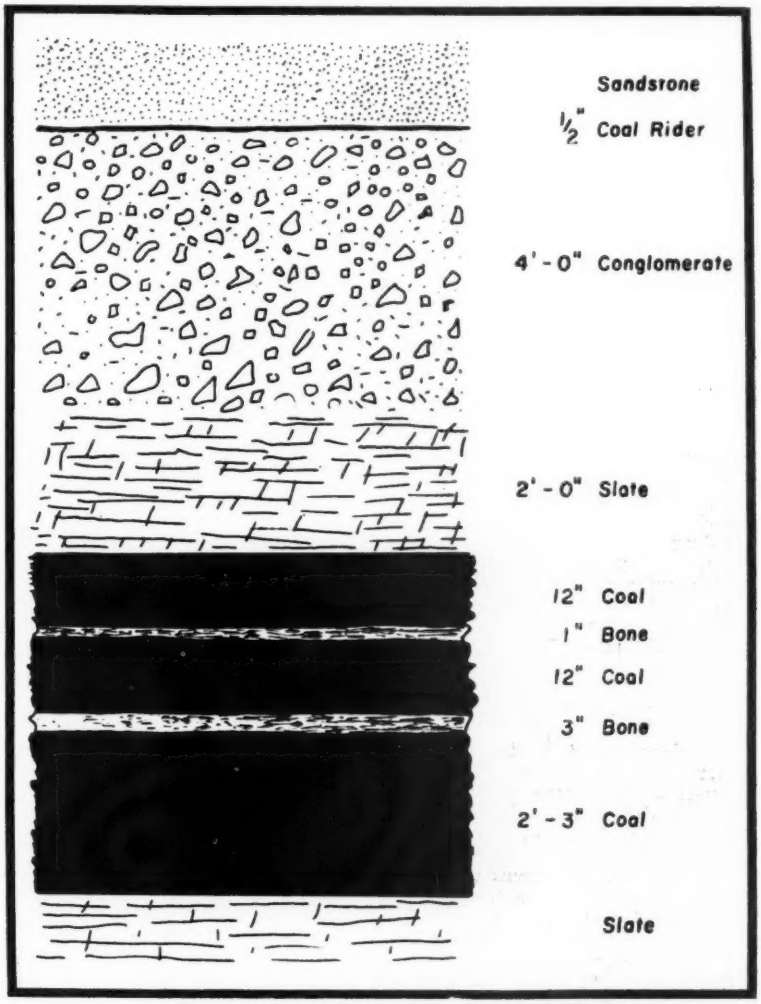
Two conventional units are operating in the unmined area adjacent to the Micajah Mains, and a conventional unit and a Lee-Norse continuous miner are operating in the unmined portion adjacent to Pinnacle Mains.

Maximum cover in this area is 900 ft and consists of a number of layers of varying thicknesses of shale and sandstone. The Pocahontas No. 3 seam here is about 55 in. thick, and the immediate roof consists of two ft of slate directly over the seam, followed by four ft of conglomerate and a ½-in. coal rider between the conglomerate and the massive sandstone which is 75.5 ft thick throughout the area. The bottom consists of a fairly firm slate which if properly drained, provides a good haulway for shuttle car operation.

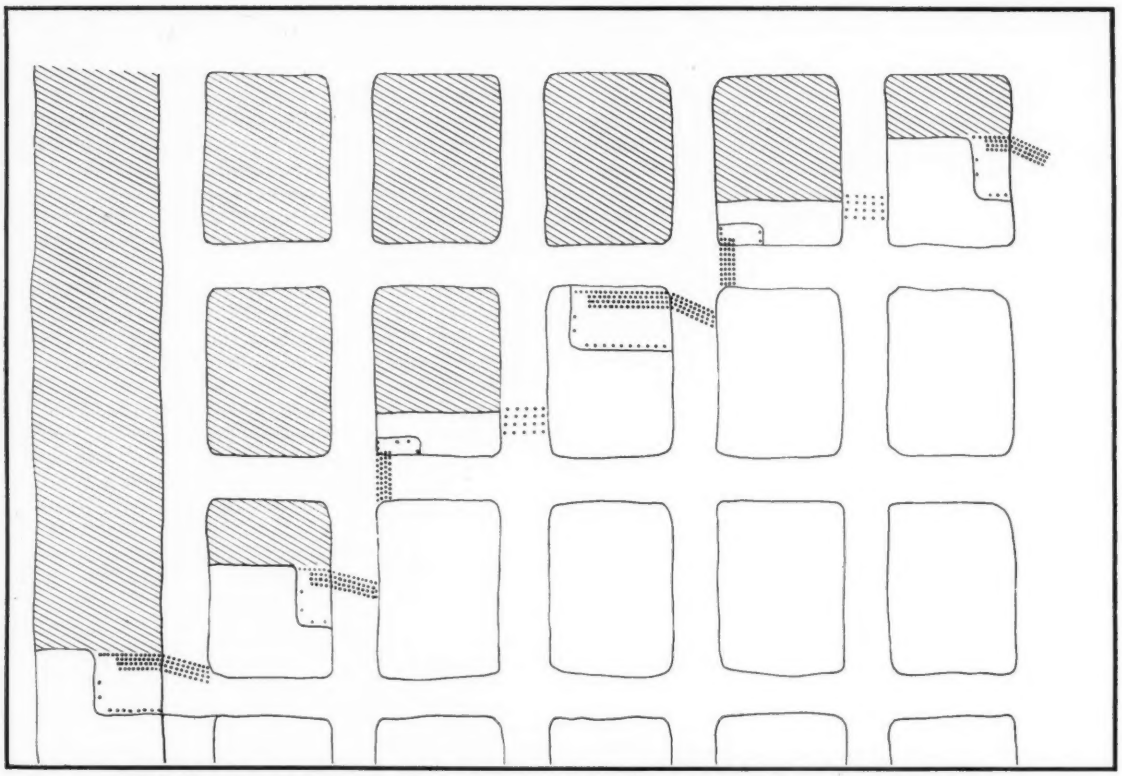
Use Bleeders

In the mining of this area a barrier pillar 275 ft thick was established around the three sides adjacent to Long Branch, Pinnacle and Micajah Mains. At intervals of varying distances this barrier was pierced by groups of multiple entries, and "butt off" entries driven around its perimeter. As mining progressed beyond the points serviced by these entries, they were provided with regulators and served as "bleeders" for the mined-out gob areas. Air from these bleeders is conducted directly to the main return air courses. Coal in the barrier pillars is recovered simultaneously with the air course chain pillars, thus providing a well-balanced productivity rate.

Sets of five-entry panels were driven from the entries along the barrier pillars, leaving a barrier of 150 ft between the panels. Panel entries were driven 20 ft wide on 75-ft centers, and crosscuts were driven on 100-ft. centers. Cinder block stoppings were erected in the crosscuts between the fourth and fifth entries and maintained to within one crosscut of the face. Intake air was coursed through entries 1 to 4, inclusive, and returned through No. 5 entry. In the face regions, the intake air was gathered and directed to No.



Elevation of immediate roof at the Itmann Mine



Timbering plan. A variation of this system is used for pillar extraction with a continuous miner unit

1 Entry, thence through #2, #3, and #4 entries, to #5 entry by means of wooden stoppings erected in #2, and #4 entries, and a canvas curtain airlock in #3 entry, all erected immediately outby the last open crosscut; and by means of line brattice strung from the last open crosscut to the face.

Track was carried in #2 entry, the loading points established in No. 3 entry at intervals of 200 ft, and the loops formed by carrying temporary track in #4 entry. As successive loading points were put into operation, the loop track was broken in #4 entry, outby the active loading point, and the temporary track was left in place so that it could readily be reused as the pillars were extracted on retreat.

Roof Support

In development work, ¾-in. and later ⅝-in. roof bolts installed on four-ft centers were used for roof support. Company standards provided for the installation of an additional row of bolts extending on the line of the entry rib, and across the mouth of the crosscut, before the first cut was mined from the crosscut. To date, this method has been very successful in supporting the slate and little "spalling" has occurred between bolts. Wherever it appears, additional support will be afforded by their installation, 3 in. by 6 in. by 30-in. cap boards are used.

After the panel has been developed a pre-determined distance, it is "butted-off" if the faces are in solid coal; or it is "tapped" through to the gob if the panel approaching from the opposite direction has been mined out before the arrival of the active panel at this location. Before beginning pillar extraction the barrier pillar between the panels is split by driving No. 6 entry outby towards the mouth of the panel and connecting it, by means of a crosscut, to No. 5 entry. Openings are not made in the pillar between No. 6 entry of this panel and No. 1 entry of the panel previously driven and mined, except at the farthest inby end where consecutive lifts are taken to remove this pillar. This procedure provides three safety features which are considered most desirable:

(1) Positive air movement from the active workings toward the gob.

(2) A means of conducting the return air current sweeping the gob directly into the return airways, and away from all electrical equipment.

(3) Minimizing the possibility of any coal being dislodged from the face of the pillar by weight as could occur if the barrier pillar split was being driven toward the gob.

Pillars Mined Open-Ended

Pillars are extracted "open-ended" and roof support is provided by the erection, as soon as space has been made available by the removal of the coal, of at least four rows of wooden posts set on two-ft centers along the open side with the outby row set slightly inby the edge of the pillar lift. Each two rows of posts is set under a half header which tends to bind them together and minimize their dislodgement. An attempt is made to maintain a "travelway" width of about 13 ft between the nearest projection of the gob timbers and the solid rib on the pillar side. Whenever the width of the pillar lift exceeds 20 ft, an additional row or rows of timbers must be set along the open-end side to maintain this distance. Except for the use of safety timbers in the face area; or, when the final cut is being removed from the pillar lift; or during a "push out" operation, posts are not generally set on the pillar side of the lift, unless the roof conditions are abnormally bad. A minimum of three safety posts are required to be set in the face of the lift as the coal is removed, and remain in place until the gob timber rows can be brought up to the face. These safety posts are set under half-headers similar to those used in the erection of the rows of gob timbers. Removal of the last cut in each pillar

lift and the "push out" or final mining of each pillar is regarded as the most hazardous operations in pillar extraction. For this reason additional rows of gob timbers must be set on both sides of the loading machine as the coal is loaded so that the operators may be provided maximum protection against the roof slate breaking off and sliding down on them from the gob.

As a general rule, the pillar is attacked initially by taking two consecutive lifts from the entry, and then the remaining pillar is removed by consecutive lifts taken from the crosscut. By this method of pillar removal the hazardous operations listed above are reduced to the irreducible limit of three, i.e., the last cut in two pillar lifts and one "push out". Before each lift is started breaker timbers, generally four rows or more if needed, are set on a slight angle in the entry to protect the haulageways; this procedure is also followed prior to the lifts being taken from the crosscut side of the pillar.

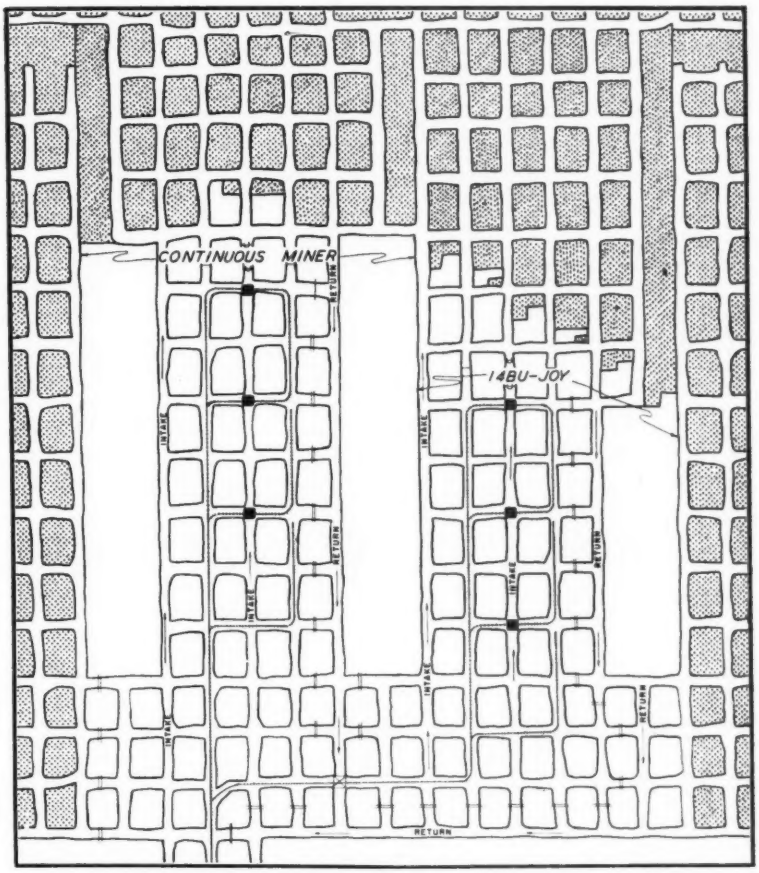
Where conventional mining units are in use, six pillars are attacked simultaneously across a face of approximately 550 ft. By strict compliance with the established extraction sequence the flanks, or the pillar lift approaches, are always protected by being anchored to a solid pillar.

Continuous Mining in Pillars

A somewhat different line of pillar extraction is maintained where continuous mining machines are in use. Here the barrier pillar or pillars are first split, as is done in the conventional loading unit sections, and a solid block left between the pillar split and the gob. The solid block on one side is then completely removed by consecutive lifts, followed by the removal, separately, of the two adjacent pillars. The miner then moves to the opposite side of the panel and the same procedure followed to remove the solid block and two adjacent pillars from this side. This procedure leaves the two center pillars intact, and they are removed by taking consecutive lifts off each pillar until both pillars are totally extracted. By this method a flat pillar line of approximately 625 ft in length is obtained.

The timbering plan in effect here during development work with continuous mining equipment is practically the same as that adopted for the conventional mining unit, i.e., ⅝-in. bolts installed on four-ft centers with an additional row set at the mouth of all intersections.

The multiple rows of breaker and gob posts adopted for pillar extraction with conventional mining units is also used for pillar extraction with a continuous mining unit except for a variation used during the simultaneous extraction of the two center pillars of the panel. Here, as the lift adjacent to the gob is removed from one pillar, multiple rows of breaker posts are installed in the mouth of this lift to provide protection to the flank or lift approach of the opposite lift. In addition, a single row of posts is also set along the side of the left adjacent to the pillar.



Pillar mining with a conventional unit and a continuous mining machine

Conclusions

Pocahontas Fuel Co. is firmly of the opinion the "open-end" method of pillar extraction, in the Pocahontas coal field at least, gives the following advantages not readily obtained in any other method in common usage:

(1) Better ventilation of the face of the lifts is maintained.
(2) The edges of the gob are more readily swept by the ventilating air current and there is less likelihood of methane accumulations adjacent to the working face.
(3) Sprags of coal are not formed as in the "split and fender" method, and there is not the possibility of those sprags being left behind to possibly prevent "clean falls" in the mined out areas.
(4) The elimination of the need of blasting, in areas in which most of the coal has been extracted, of the "sprags" and "fenders" to permit "free falling" of an unsupported area.
(5) Reducing, by practically the complete extraction of the coal, the possibility of overburdened weight being transmitted from the gob area to the active working areas, thus minimizing the probability of "squeezes" and "bumping."
(6) High percentage of recovery.





General surface view at the Peterson underground iron mine. Note the headframe and shaft enclosure, and the 60-ft-high loading pocket structure at the right. The aerial tramway loading terminal is shown at the left

Ore Handling and Stocking Facilities at the Peterson Mine

Here are the engineering details of the stockpile facilities at Pickands Mather & Company's new Peterson Mine on the Gogebic range of northern Michigan. The stocking method had to satisfy the following requirements: (1) Dependable and free from breakdowns for six-month stocking season. (2) Stock at a peak capacity of 600 tph. (3) Capable of operating during extreme cold and snowy weather. (4) Build a pile of approximately 1,000,000 tons of ore in a limited area of about 400 by 2000 ft with pile height not to exceed 70 ft. (5) Capable of stocking two separate ore grades with a minimum of changeover time. (6) Have a low operating, maintenance, and initial investment cost. The use of an aerial tramway system for this job has been highly satisfactory

By P. F. TORREANO
Assistant Superintendent
Peterson Mine, Pickands, Mather & Co.

THE Peterson Mine, owned by the Puritan Mining Co. and operated by Pickands Mather & Co., is located 1½ miles west of Bessemer, Mich., which is about in the center of the productive portion of the Gogebic iron range. An extensive drilling and exploration program that started in 1942 and continued through 1949 showed that ore existed below the previous mining depth of 2100 ft in the old Puritan, Ironton and Yale mines. Diamond drilling showed that this ore continued to a depth of 4000 ft below surface with no apparent structural reason why the ore bodies would not extend deeper in their eastward pitching course down the dike trough. From a study of the drilling results it was concluded that the main ore body, plus the shallower auxiliary ore bodies, could be of sufficient size and distribution to support a mining operation yielding an annual tonnage at least equal to, and perhaps eventually larger, than the current output of the major producing mines on the range.

It was apparent from the start of the exploration program that nothing short of a large operation would be economically feasible because of the great depth, unknown water problems, and high construction and development costs. Large production, in turn, rendered existing facilities obsolete, making it necessary to consider an entirely new shaft and surface plant of large capacity. Work on this new installation was started during the fall of 1950 and by May 1954 development rock was being hoisted through the new shaft. In the middle of 1955 the screening and crushing plant and the conveyors to the shipping pocket were put into operation. Stocking of ore by means of the new aerial tramway began at the start of the 1955 fall stocking season.

Shaft

The shaft is vertical, the general arrangement of which is typical of the Gogebic Range. It is rectangular in plan with outside dimensions of 14 ft by 23 ft. The shaft is oriented with the long axis east-west and the skip compartments on the west side. The skip compartments are 6 ft o in. by 6 ft 2$\frac{7}{16}$ in. Treated, short-leaf pine guide, 6 by 10 in., are located in the center of the 6 ft 0 in. side. The ore and development rock is hoisted in two 240 cu ft bottom dump skips. These skips are equipped with rubber rollers which engage the shaft guides.

The skip hoist is a Nordberg double-drum, single-clutched hoist with 15-ft diam by 98-in. face, cylindrical, parallel-grooved drums. It is driven by two 2250-hp, 750-v dc motors and is capable of hoisting an ore load of 15 long tons at a speed of 2400 fpm. The two skips operate in balance with 2¼-in. hoisting rope. The dc power for the hoist motors is generated by a 3500 kw motor-generator set consisting of two 1750-kw, 750-v, dc generators connected outboard of a 4000-hp induction motor connected to a 14-ft 3-in.-diam, 60-ton flywheel. To insure equal distribution of the power load the two generators and two hoist motors are connected in series. The speed and power demands of the hoist motors are controlled by Allis-Chalmers Regulex generators and motors.

Headframe

The headframe and shaft enclosure is 42 by 130 ft at the base and extends to a height of 151½ ft above the collar. The skip sheaves are 116 ft and the cage sheaves 135 ft above the collar. The entire structure is of steel, covered with corrugated sheet iron and insulated with fibre glass.

The head sheaves and holddown sheaves are cast steel with anti-friction roller bearings. The skip sheaves are 14 ft in diameter and the cage sheaves 12 ft. Extending eastward from the cage compartments on surface is a 30-in. gauge track system for handling supplies and timber. It leads to the timber field and shop building.

The headframe enclosure, west of the shaft, houses the screening and crushing plant. Several new features have been incorporated in the design of this equipment, namely: (1) the ore is hoisted in 240-cu ft bottom dump skips; (2) a rock pocket permits the handling of rock and wet ore by truck without going through the screening and crushing plant; (3) roll feeders are used to control the flow of ore to the screens; and (4) provisions have been made for two screen separations.

Immediately below the skip dump is an air-operated deflector door that directs the material into either the rock pocket or the feeder hopper. The rock pocket with a capacity of 2800 cu ft (12 skips), has air-operated guillotine doors for loading into dump trucks. The ore is moved from the feeder hopper onto the screens at a uniform rate, by two, seven-ft diam, five-ft face roll feeders. The feeders are rotated from ½ to 1½ rpm by a 10-hp, dc motor through a gear reducer. A hydraulically operated gate controls the thickness of the ore ribbon fed by the drums.

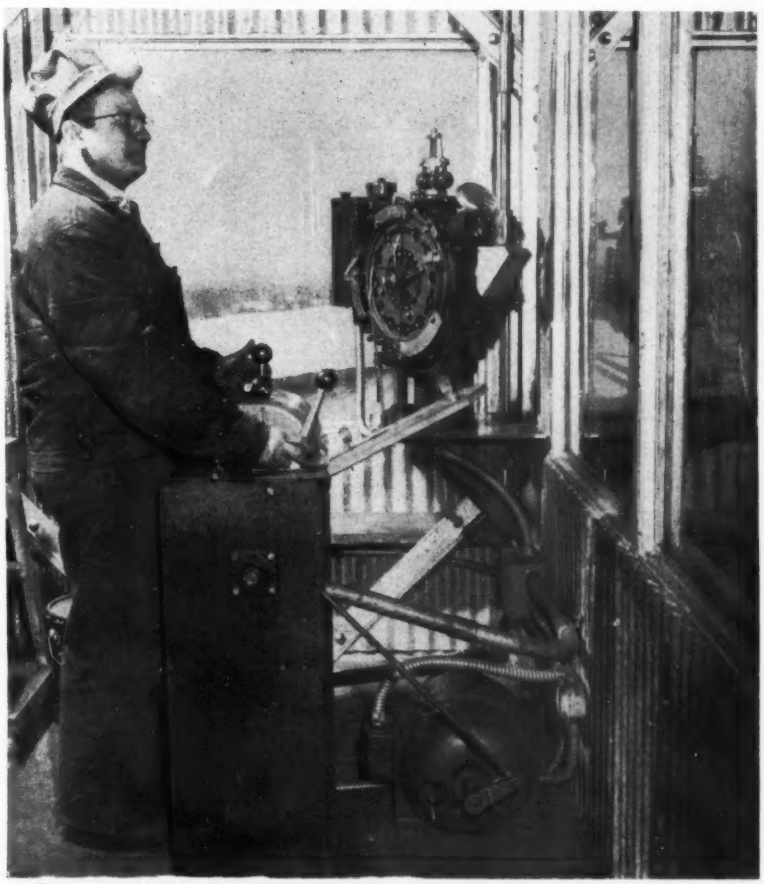
Screening is done by two 5 x 14-ft double-deck vibrating screens. The undersize from the bottom screens goes on the "fines" cross belt and the oversize goes on the "coarse" cross belt. The oversize from the top screen goes directly into the crusher, which is a 30 x 42-in. overhead eccentric jaw crusher equipped with a 100-hp induction motor. A short 48-in. belt under the crusher conveys the crushed material to the "coarse" cross conveyor. The "fines" and "coarse" cross conveyors are 30-in. belts traveling at 350 fpm and are 66 ft long. They both discharge onto the main belt conveyors leading to the loading pocket.

Loading Pocket

The main belt conveyors, which receive the ore from the short cross conveyors previously described, start at a transfer point 40 ft south of the headframe and extend west a distance of 306 ft to the loading pocket. The merchant ore belt—a twist or turnover belt—is 30 in. wide, travels 400 fpm, and is powered by a 75-hp motor. A temporary coarse material belt is also 30 in. wide but extends only 150 ft up the gallery where it discharges into a temporary pocket. The coarse material is presently stocked by truck.

The loading pocket is a steel structure 60 ft high with two bins of 90-ton capacity each. A railroad track passes under each bin making it possible to load cars on both tracks. These double tracks extend 1000 ft upgrade (south) and 600 ft downgrade (north) from the pocket at a two percent grade so that the cars being loaded will move by gravity. Two air-operated, undercut doors on each bin permit the loading of a 70-ton ore car in one spotting. A two-car length sampler's platform facilitates the taking of car samples.

The upper section of the loading pocket is arranged so that the discharge from the main belt can be directed into either the car loading bins or the stocking conveyor. During the shipping season, the railroad cars are loaded directly. During the stock-



The entire stocking operation is controlled by one operator located in the control room of the loading terminal



Aerial tramway loading terminal. It is a fabricated steel structure 30 by 64 ft at the base and 125 ft high, and supports the track cables, terminal rails, hopper bins, loading chutes and conveyor equipment and gallery

ing period, the ore is transferred to the stocking conveyor which leads from the loading pocket to the tramway terminal. The stocking conveyor —a twist or turnover belt—is 30 in. wide, travels 450 fpm, and is powered by a 100-hp motor. It extends from the loading pocket 42 ft above ground level to the tramway loading terminal 315 ft to the west and 105 ft above ground level. The ore is discharged into 60-ton circular bins from which it feeds directly into the aerial tram cars.

Extensive Study Made

When the original plans for the Peterson Mine were being formulated, it became apparent that considerable study was necessary to provide an adequate and economic method of stocking ore. Since all of the ore produced on the Gogebic Range of Michigan is shipped by lake boats, it is necessary to stock the mine production for five to six months of the year when Lake Superior is closed to navigation. Previous stocking methods used in the area were considered incapable of handling the large peak tonnages and were also high in operating costs. The acceptable stocking method had to satisfy the following requirements: (1) Dependable and free from breakdowns or major repairs for the six-month stocking season. Since all of the mine production must be stocked during the winter months, a breakdown of the stocking system would force a complete mine shutdown. (2) Stock at a peak capacity of 600 long tons per hour. It was realized that the mine might never produce at this high rate, but it was considered necessary that the stocking facilities have a capacity equivalent to the peak mine hoist capacity. (3) Capable of operating during extreme cold and snowy winter weather without interference. (4) Build a pile containing approximately 1,000,000 tons of ore, weighing 15 cu ft per ton, in a limited area of about 400 by 2000 ft and with a pile height not to exceed 70 ft. The limited area available for stocking such a large tonnage presented a serious problem. A height of 70 ft was considered as a maximum that could be loaded out with a standard model shovel. This pile had to lend itself to being reclaimed every season without obstructions or interference. (5) Capable of stocking two separate ore grades with a minimum of change-over time. Normally a Bessemer and non-Bessemer grade ore are hoisted intermittently throughout the shift and stock separately. (6) Have low operating and maintenance costs with a moderate initial capital investment—a system that would have the lowest total stocking cost for the projected tonnage and life of the property.

An extensive study of all the possible stocking methods showed that there were few that would be practical. Preliminary layouts of the different methods were made and analyzed. Tentative initial costs were obtained from the manufacturers and operating costs were worked out from previous experience, or estimated. The method considered to be best from both the operating and the cost standpoint was the aerial tramway. This method is used rather extensively for waste disposal in the coal fields and no reason could be found why it would not work satisfactorily for the stocking of iron ore. Members of the operating and mechanical engineering departments visited and observed the operation of several trams in the coal fields. They were impressed with their performance and convinced that the aerial tramway would best suit the needs of the Peterson mine. After many design features, operational details and costs were discussed and considered, a contract for this stocking tramway was let in the fall of 1953.

Aerial Tramway

The tram is a two-carrier reversible jig-back aerial tramway with two 170-cu ft cars capable of traveling 1500 fpm. Each of the two cars is suspended from an independent cable span consisting of four, two-in. lock-coil cables extending 1500 ft from the loading terminal structure at a height of 88 ft to the top of a tail tower 165 ft high. The two tail towers are 125 ft apart. At the loading terminal the cars are loaded through undercut gates which are opened and closed by the car as it enters and leaves the terminal. The 10-ton load is automatically discharged as desired at any point along the 1500-ft span. The stockpile will be 70 ft high, 265 ft wide at the base on the terminal end, and 350 ft wide on the far end. It has a capacity of 1,000,000 tons. Two separate piles of smaller total capacity can be made if so desired.

The stockpile ground and floor is sloped upwards towards the tail towers at a two percent grade. This

facilitated leveling off the area with a minimum of earth movement, offers good drainage, and, if necessity arises, allows railroad cars to be moved by gravity for stockpile loading. The cost of a spotting engine is one of the large items of loading costs and could be eliminated by gravity movement of the railroad cars.

Loading Terminal

The loading terminal is a fabricated steel structure 30 x 64 ft at the base and 125 ft high. This structure supports the track cables, terminal rails, hopper bins, loading chutes and conveyor equipment and gallery. It is supported by eight vertical columns and four back legs on the rope side. There are four floor decks. The lower one is an access deck to get at the underside of the cars and to catch any spillage that might occur. The second is the operator's deck and also has the loading chutes. The top deck supports the belt conveyor drive and motor and is an access opening to the top of the bins.

The entire structure above the lower floor is covered with "Steelbestos" and two in. of fiber glass insulation. All of the floors are of a lightweight, concrete. Motor-operated doors are provided for the tram car portals. Thermopane windows in the operator's room offer clear visibility for the movement of the tram cars in any position along the span. A monorail is mounted over the cableways to facilitate changing of the cars and it also extends into the terminal to handle the conveyor equipment. A stairway extends from the ground elevation to the top deck. The roof is a flat, built-up, gravel type.

The foundation for this structure consists of 306 cu yd of concrete with eight tons of reinforcing bars and nine tons of anchor steel imbedded in it and supported by 74, 10 in. x 42 lb steel-bearing piles extending from 42 to 60 ft in the ground below the foundation. The terminal structure contains 202 tons of structural steel.

Ore is discharged from the stocking conveyor into two conical bins 11 ft 6 in. at the top and 18 ft deep, having a capacity of 900 cu ft each. Attached to the bottom of each bin is a 42 x48-in. rectangular chute and undercut gate that feeds directly into the tram cars. This undercut gate is automatically opened and closed as the car enters and leaves the loading point.

Tail Towers

The tail towers are pivoted, fabricated steel structures 10 x 10 ft square, extending 172 ft 6 in. in height. They are located 1500 ft southwest of the loading terminal and 62½ ft northwest and southeast of the tram center line. The track cables and anchor cable rope attachments are 165 ft above the base and the side guy anchor connections are 106 ft above the base. A ladderway with safety cage reaches from the ground to the top of each tower. A platform at the top of the towers aids in lubrication and inspection of the tower sheaves. Also mounted on top of the towers is a crane beam to facilitate changing cables and sheaves and making other repairs. These towers support the track cables, tail anchor cables, side anchor cables, and also the main and deflector sheaves for the haul rope.

The tower foundations are spread footing foundations that contain 111 cu yd of concrete, 2½ tons of reinforcing steel and two tons of anchor steel.

The tail anchors are of reinforced concrete that extend 21 ft 6 in. into the ground and are located 250 ft south of the tail towers. Each tail anchor consists of 60 yd of concrete, one ton of reinforcing rods and eight tons of anchor steel.

On the top of each tower a 72-in. diam sheave is mounted parallel to the center line of the tram leg at a distance of seven ft below the rope attachments. Another 72-in. sheave—the bottom sheave—is set diagonally across the structure at a point 82 ft above the tower base. A center sheave, which is normal to the tram center line, is at a distance of 105 ft above the base. The east tower has the bottom sheave mounted in a movable set of guides to permit take-up and adjustment of haul rope tension.



The tail towers are pivoted, fabricated steel structures 10 by 10 ft sq. extending 172 ft 6 in. in height

This sheave can be moved a distance of 25 ft vertically by a small hand-operated winch. When the proper haul rope tension is reached the sheave supports are pinned solidly to the guides. This sheave arrangement is necessary to deflect the rope from one tower to the other, permit a means of haul rope take-up, and to resolve the forces along the center line of the towers.

Track Cables

In any aerial tramway the car is supported and moves on a cable span running from the loading terminal to the tail towers. The selection of the proper size and construction of these cables is of great importance. They are one of the major costs in the operation of aerial trams. Their life depends to a large extent upon: (1) the tension under which they are required to operate; (2) the maximum size of the individual wires used in their construction; and (3) the magnitude of the bending the rope is subjected to as the wheels pass over it.

The track cables used on the Peterson mine tram, of which there are eight in number 1505 ft long—four supporting each car—are two in. in diameter quintuple, half-lock coil cable of a special H and O construction. The core consists of 49 round wires ranging in diameters from 0.048 to 0.095 in. Built around this core are the five layers of H and O wires alternating between right-hand and left-hand lay. The first layer of H and O wire is 0.110 in. deep, the second layer is 0.125 in. deep, the third layer 0.145 in. deep, and the fourth and fifth layers are 0.160 in. deep. These ropes weigh 9.9 lb per lineal foot and have a breaking strength of 263 tons. Since the maximum full load rope tension will not exceed 172,000 lb, these ropes will operate under a safety factor of over three. The H and O construction is used to prevent a possible unraveling of a broken wire as the tram car wheels pass over the rope.

Haul Rope

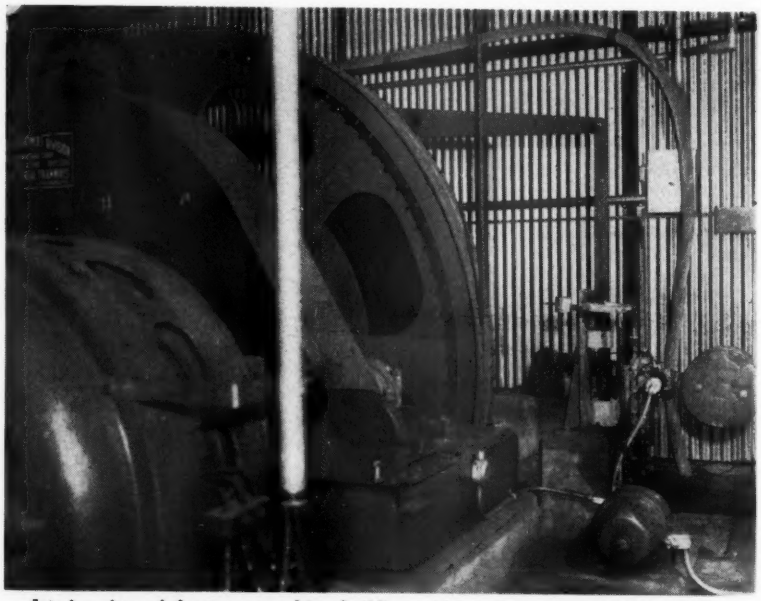
The haul rope is a continuous length of 1¼-in. rope that is attached solidly to the west car, passes over the main deflector sheave, engages the drive wheel, passes through the east car, and makes an endless rope passing over properly spaced sheaves in the tail towers. This rope is a 6 x 25 filler wire type "W," improved plow steel, lang-lay, hemp center, preformed rope. This construction gives maximum flexibility with a minimum internal displacement. This rope operates under a tension of 12,000 to 20,000 lb.

The eight sheaves over which the haul rope passes are 72-in. diam molytelastic alloy steel with 6½-in. shaft and 5½-in. roller bearings.

Tram Cars

The tram car is a "V" bottom car of 170 cu ft free discharge capacity. The front and back sides are sloped 60° with a door mounted on the front side. The body is framed with channels and angles and the inside plates are ½-in. and ⅜-in. liner plates of stainless steel which offer a smooth polished surface on which ore will not readily stick. Four in. of special isocyanate insulation fills the space between the wear plates and outside body plates to keep the car from freezing by holding the latent heat of the ore.

The door is 5 ft 3 in. wide by 3 ft 10 in. high and is mounted so that it will close by gravity. A spring loaded latch locks the door in the closed position. When this latch is released by the tripping device, the weight of the ore forces the door open. The door latch is tripped by a cam traveling on a worm shaft. The worm shaft is rotated by one set of the car wheels through sprocket wheels and chain.



Interior view of the tramway drive building which is located at the base of the loading terminal. The remotely controlled 144-in. diam drive wheel is driven by a 300 hp wound rotor induction motor through a pinion and herringbone gear

The point of dumping is easily and very quickly changed by the positioning of a rocker arm on the rocker bar. By providing two cams on the one worm shaft it is possible to quickly change from one dumping position to another when stocking two separate grades.

The body of the car is suspended by a front and rear axle, 8 ft 7 in. apart. These axles are attached to a yoke assembly that support two, four-wheel trucks that engage the track cables. These four-wheel trucks are mounted on the yoke assembly by pins so they can pivot independently of each other. The 12-in. diam wheels are of alloy cast steel with rope grooves machined and flame-hardened and equipped with roller bearings. By using 32 wheels the wheel loading is reduced to less than 1400 lb which results in a small amount of deflection under the wheels and should give long track cable life.

The haul rope is attached solidly to the west car by rope sockets but passes through the east car which is attached to it by a rope-grip device with a heavy spring. The position of the east car on the rope is changed as desired by removing the spring tension with a 7½-ton hydraulic jack that is mounted on the car. In this way the relative position of the two cars can be easily and quickly changed. Projections on the front of the car body engage the undercut gates to open and close them as the car enters and leaves the loading terminal.

Tramway Drive

Located at ground elevation directly below the main deflector sheaves and north of the loading terminal is the tramway drive. It is remotely controlled by the operator in the loading terminal above. This drive consists of a drive wheel that engages the haul rope with a supporting base and reduction gears, a post brake, and the drive motor and electrical controls. All of this equipment is housed in a 26-ft x 37-ft-6-in. steel building that is heated by an automatic oil heater.

The drive wheel is a type of band or rope drive—Koepe type friction hoist. It is a weldment 144 in. in diameter by 9½-in. face with a 13½-in. diam shaft mounted on two, 9-in. spherical roller bearings. The haul rope makes

180° contact with this wheel. The liner material that engages the rope is made of grooved blocks of laminated rubber belting fabric—conveyor belting material. Blocks of this material 3 x 6 x ¾ in. thick are cemented together around the periphery of the wheel by a Neoprene cement. Clamp plates fasten the blocks tightly to the wheel. The width of the blocks permits two grooves three in. apart. When one groove shows excessive wear, the rope can be placed into the other groove, thereby doubling the life of the liner material.

A conventional post type brake offers the necessary brake protection. An 84-in. diam by 11½-in. face brake drum is bolted solidly to the drive wheel. The brake is gravity loaded and released by a 4½-in. diam x 14-in. stroke hydraulic cylinder. The hydraulic pressure is furnished by an accumulator. The brake valve is remotely controlled by the operator in the loading terminal through a 15-hp selsyn transmitter and receiver.

The hoist is driven by a 300-hp, 2200-v, 450-rpm wound rotor induction motor through a pinion and herringbone gear (gear ratio 11.3 to 1). The motor control is a dc magnetic contractor with a definite time delay. A plugging and jamming circuit is provided for normal use. There are seven notches or points of contact. The master control switch is located in the control room in the loading terminal. The hoist motor is protected from overload by current limit switches and also by an overspeed cut-out switch.

Safety Devices

Like other mine hoist equipment, considerable thought and study was given to protect the tram from damage due to mechanical breakdowns or human failings. For this reason a substantial hydraulically operated post brake was provided. This brake has sufficient capacity to stop the hoist under any load or speed condition that might develop. A Lily control mounted in the control room and driven from the east deflector sheave through shafts and beveled gears offers overspeed and overtravel protection. A foot switch must be depressed before the car can be brought into the terminal. This insures that the operator is aware of the car's position and is prepared to bring the car into the terminal. Dial indicators to give the position of both cars are also mounted on the Lily control wheel. Limit switches on the electrically operated portal doors insure that they are fully opened before the hoist can be operated.

Operation

The entire stocking operation is controlled by one operator located in the control room of the loading terminal. From here he can observe the operation of the car from the point of loading through to the dumping point. The large thermopane windows give him clear visibility at all times. His operating controls — master control switch, brake lever and foot switch—are mounted in a console and the Lily controller with indicator dials is mounted a short distance in front and to his left. The other operating switches are located on the wall behind him. Two flood lights mounted on the terminal provide illumination for the cars and stockpile during night operation. A bin indicator located in one of the receiving bins automatically shuts off the conveyors if, for some reason, the bins become overfilled.

Maintenance

Since the tramway has been in operation but a short time, it is difficult to evaluate the maintenance problems that may arise. To date no particular problems have developed. Routine lubrication and visual inspection and adjustment of the equipment in the tram terminal and hoist building is done daily. Monthly checks are made of the ropes, sheaves and rope attachments. Since most of this equipment is similar to the main hoists, it will receive the same care and attention.

As time goes on some of the components will wear and have to be replaced. The major ones will be: (a) Fabric lining of the drive wheel. These blocks of fabric material are inexpensive and are easily installed. The double groove will give double life and should last a long time. In the two months of operation the lining material has shown very little wear. (b) Haul rope. Like other ropes that constantly pass over sheaves, it will wear. Being a flexible 6 x 25 hemp center rope passing over 72-in. sheaves and operating under a light load, it should have a reasonably long life. The tension under which this rope is required to operate is determined by the tension necessary to keep the rope from touching the top of the pile. For a 70-ft high pile this tension will not exceed 20,000 lb, which is a small load for this size rope. The use of the fabric lining material for the drive wheel instead of mechanical grips will give it much better life than on most conventional tramways.

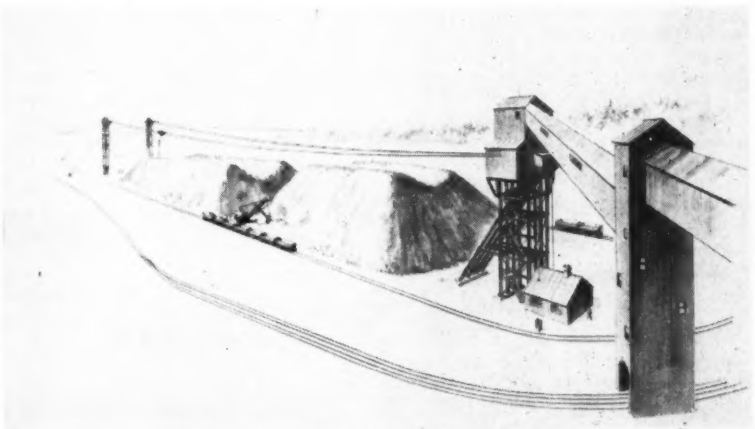
No lubrication is used on this rope. However, it is periodically sprayed with a rust inhibitor to prevent corrosion. (c) Wear and replacement of the track cables will, no doubt, be the greatest major operating expense. Since these two-in. quintuple half-lock cables are the largest used to date and have been in service for only a short time, no data is available. However, they should give much longer life than the smaller sizes. The use of 32 wheels on the tram cars which reduces the wheel loading, in conjunction with the high rope tension used, has reduced the amount of deflection under each wheel. This is an important factor in rope life.

The track cables are lubricated by drip oilers mounted on the tram cars.

Results Satisfactory

In conclusion, the use of the aerial tramway system for stocking iron ore has been highly satisfactory. Even though it has been in operation for a short period of time, the results indicate that it is safe, dependable and economical. Many of the changes in design and construction that were made to handle wet and sticky ore during extreme cold weather have worked out exceptionally well.

The author wishes to acknowledge and express thanks and appreciation to the personnel of Pickands, Mather & Co. and to the Interstate Equipment Co. who gave generously of their knowledge, time and effort. A project of this magnitude requires much thought, planning and engineering from many individuals. The final completion and successful operation is the result of close cooperation of the many people involved.



Artist's sketch of the Peterson mine aerial tramway

Use of Airleg for Long-Hole Prospecting at Bunker Hill and Crescent Mines

Two well-qualified men describe one company's experimental long-hole drilling program designed to test the airleg drill as a prospecting tool. Drilling costs appear to justify its use in the irregular and complex ore bodies of the Bunker Hill Mine and the Crescent Mine. Other advantages of this light-weight drilling machine are noted

By E. B. OLDS and D. C. LONG
Superintendent, Geologist
Crescent Mine
The Bunker Hill Co.

LONG-HOLE drilling as a method of prospecting in underground metal mines was developed about 30 years ago. The method consists of boring holes, usually less than 200 ft deep, into the walls of mine openings to obtain information. The drilling unit is a conventional underground rock drill such as a drifter or a stoper fitted with sectional drill rods to which are attached bits of several designs. Cuttings from the hole are collected for assay and examination.

The reliability of information gained from long-hole drilling varies from place to place. Some operators regard the drills as valuable tools and feel that their use in a mine is almost indispensable to thorough prospecting. Others are of the opinion that results are not always commensurate with costs.

At the Bunker Hill Mine and the Crescent Mine, much of the ore is extremely irregular in outline and in places lies in structurally complex areas. The delineation of ore prior to stoping commonly is difficult. It is often necessary to carry out extensive drilling programs in conjunction with cross-cutting, drifting, and raising to obtain additional information for the solution of problems. In the past, most of these holes have been put down with diamond drills.

The Airleg Drill

Recent improvements in equipment used in long-hole drilling are responsible for an experimental program at the Bunker Hill designed to test the machines and measure the results. The airleg drill using light drill rods and tungsten carbide insert bits was chosen as it seemed to offer advantages over older types of long-hole equipment.

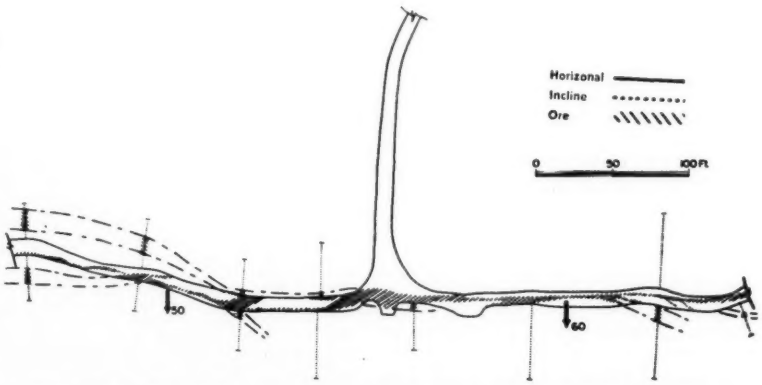
The airleg is a light flexible drilling unit which can be adapted easily to long-hole prospecting in drifts and stopes. It is operated by one man. A minimum of time and space are required for setting up the machine or removing it from the drill site. For example, in a haulage way the rods can be detached from the machine in a matter of seconds thereby leaving the way clear for traffic.

The three-in. bore Atlas Copco airleg drill performs well for long-hole drilling at both the Bunker Hill Mine and the Crescent Mine, particularly in hard quartzite. Alloy steel, ⅞-in. hexagonal section, with rope-thread couplings gives very satisfactory performance. Tungsten carbide insert chisel bits, also with rope threads, are being used with considerable success. The development of the rope thread constitutes a major improvement in the design of rod couplings. It greatly reduces steel breakage and the time required for removing rods from the hole.

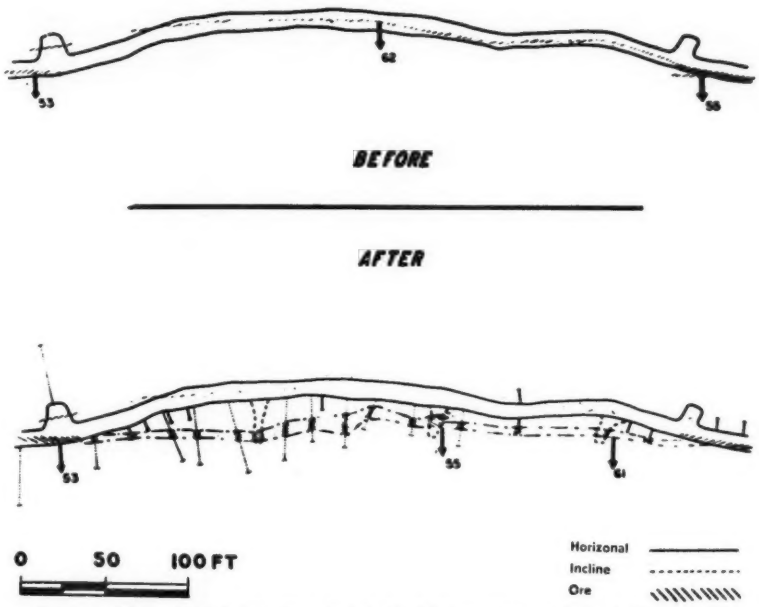
Method Employed

Procedure in using the airleg drill as a long-hole machine is similar to that of long-holing with conventional drifters. A hole in soft to medium hard rock is inclined 5 to 20 degrees above the horizontal. Drilling rate is increased in hard rock by inclining the hole to at least 15 to 20 degrees. Steeply inclined holes (45 degrees or more above the horizontal) are impractical if drilled to depths of more than 30 or 40 ft. At these depths, the weight of the rods against the machine becomes excessive. Moreover, the labor involved by one man handling the rods is prohibitive.

Samples of cuttings from the hole are taken at intervals of five ft or wherever the driller observes a change in the color of the sludge. To insure a better recovery of cuttings, a by-



Bunker Hill Mine, 23½ level, Emory vein. Figure shows a modified pattern of long-hole drilling along a fissure vein



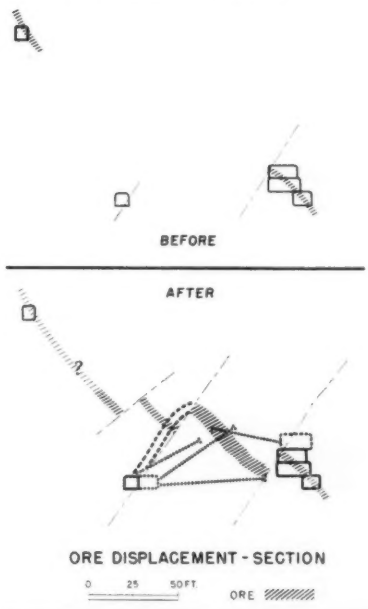
Crescent Mine, 3200 level. The long-hole drill can be used to delineate and evaluate a split in a vein

pass is usually drilled to intersect the hole approximately three ft from the collar. The by-pass hole is fitted with a length of hose leading to a sludge box. If the walls at the drill site are loose or tightly timbered, the by-pass is omitted. Instead, the hole is cased to solid rock. An attempt then is made to collect as much of the sludge as is possible by allowing the return water from the hole to drain directly into a box placed beneath the casing.

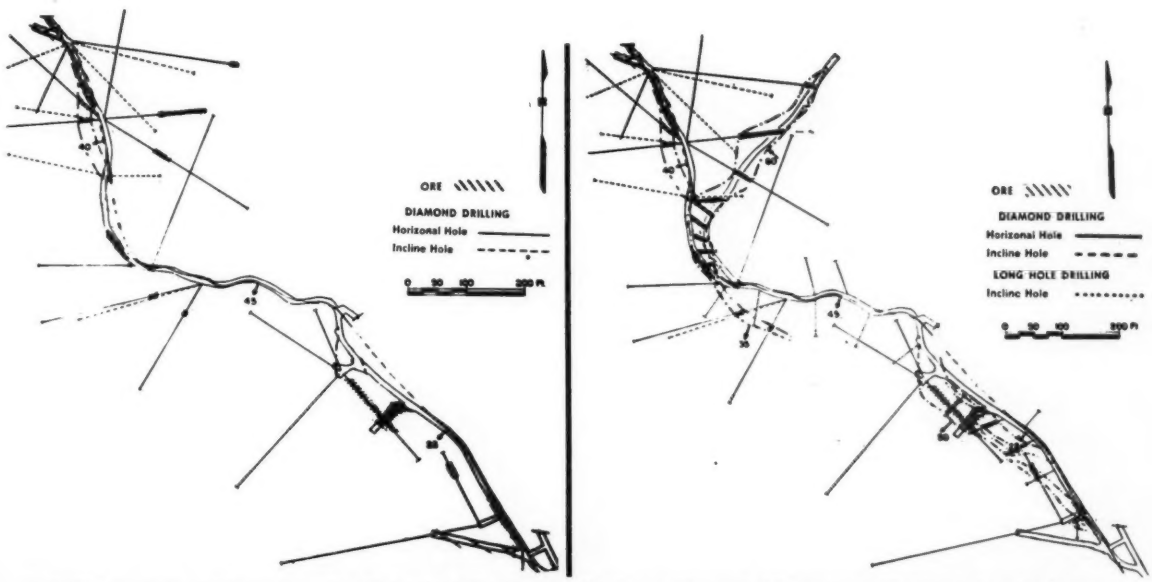
The long-holes drilled by the company provide information which is used to determine the outline of irregular ore bodies prior to and during stoping. This information supplements data gathered by mapping and sampling of all mine openings. Specifically, it aids in determining the position, shape, and size of the ore. Estimates as to grade based on assay of the cuttings are reliable where the ore and the wall rock are firm. In bad ground, assay data admittedly is inaccurate. However, a good log of the hole interpreted by an experienced supervisor will do much toward avoiding serious errors.

The accompanying figures show the application of the airleg long-hole drill to the solution of specific problems in the Bunker Hill and the Crescent Mines.

(Continued on page 75)



Bunker Hill Mine, 22½ level. Ike vein. Application of the long-hole drill to the solution of a fault problem was another test for the airleg machine



Outlining an ore fault zone on the 18 level of The Bunker Hill Mine. Diamond drill pattern, left, shows how fault was first located. Detailed outlining of these zones was accomplished with inclined long hole drilling as shown at right.



The best mining conditions available with the most modern equipment in production will not produce the optimum results unless employes know how to do their jobs, want to do their jobs and actually perform the work in a prescribed manner

Industrial Engineering and Cost Control —An Operating Viewpoint

This progressive coal producer has benefited in 19 ways from the use of its industrial engineering program during the last five years

By RALPH B. DEAN
Administrative Assistant
The Lorado Coal Mining Co.

INDUSTRIAL engineering, applied to coal mining, is based on the premise that all cost can be controlled, that the only way to control the total cost is to control each element of expense, and that these elements are to be controlled at their point of origin. Cost control is accomplished by the determination of standards to measure performance, assignment of cost responsibility, delegating authority commensurate with the responsibility, and providing financial incentive to get work performed efficiently and profitably.

This is the philosophy of the management program at Lorado that was set up by T. M. Barry, who now heads Theodore Barry and Associates of Los Angeles, Calif. This program went into effect October 1951 and by June 1954 the direct cost of mining coal at Lorado had been reduced by about 25 percent and production in terms of face tons per man-day (without elaborate equipment changes) had increased by 40 percent. Further reductions of cost and improvement in face tonnage have materialized since June 1954 by continued refinement and application of the management program.

It's More Than Setting Standards

The operating viewpoint of industrial engineering at Lorado, however, is more than just a means of setting standards and evaluating performances. It is all of the machinery for Planning and Control. In effect, management has developed an integrated cost control program.

What does this machinery consist of at Lorado?

(1) ***Time study and operation analysis to learn the best way of doing any job and the standard or normal time it should take.***

This standard or normal time is broken down into elements of work and note made of the variables that control these times. In arriving at the normal time, a recording is made of each element of work and the actual time required for each recorded element. The next step is to convert actual recorded time (by elements) into normal time. This is done by applying an accomplishment rating to the actual time. Normal time is then converted into standard time by adding a rest factor or fatigue allowance to the normal time. This standard time is used in setting up the elements of work necessary to complete any operation.

(2) ***Measuring performances against these standards.***

Lorado uses the Basic Time Data method of setting standards. Time-study summaries are posted in the Basic Data Books with a separate page (or pages) for each element of each operation. Obtaining time standards through basic time values allows more accurate standards and reduces the need for new time studies every time a condition is changed. Engineers inspect each mine unit weekly to see which standards apply that week. Conditions and equipment cause continual fluctuations, but Lorado feels that it is 95 percent right 95 percent of the time.

(3) ***Balancing work in groups by distribution of the work in equal amounts to each of the production men in a crew.***

The distribution of work according to standard times affords each group performing any complete operation a more balanced cycle time and should compare (very closely) to all other operation cycle times being performed during any work shift for maximum production. The discovery of work imbalance on a crew might be corrected, for example, by the assignment of work from one face crew (or man) to another on the same mining unit.

(4) *Set standards for work away from the faces in the same general way.*

Standards for any crew or worker can be set by simply building up a standard based on the nature of the job as it is currently being done. It has been discovered through time study analysis that many jobs could be performed with greater ease and efficiency by a change in methods and a redistribution of work.

(5) *Budget both labor and supply expense according to engineered studies of the actual needs rather than by historical records of actual costs.*

This, as you can imagine, takes some real doing. Lorado is not satisfied that it has completely accurate figures for all costs. Equipment overhaul costs, some other maintenance expenses—predominantly those on the tipples, are examples of such costs. But it is believed that total cost standards, which fluctuate regularly to meet the mining conditions and production standards, are always within two or three percent of being accurate.

(6) *These standards, and other engineering indexes, are used to evaluate the performance of supervisors.*

Lorado Coal Mining Co. began paying supervisors an incentive, four years ago, and the results have been very satisfying. The purpose of this incentive plan is to reward all above standard supervisory performances in proportion to the worth of these performances to the company. The coal company recognizes (1) that true yardsticks exist, which make possible accurate appraisal of the work done by each participating member of supervision; (2) that the levels of supervisory performance vary with different individuals; and that (3) a fair compensation program should pay in direct proportion to the amount, quality and economy of work performed.

(7) *An industrial engineering program is used to plan haulage and schedule trips, to select locations for side tracks and storage points, and to learn the effect of changes in methods, etc.*

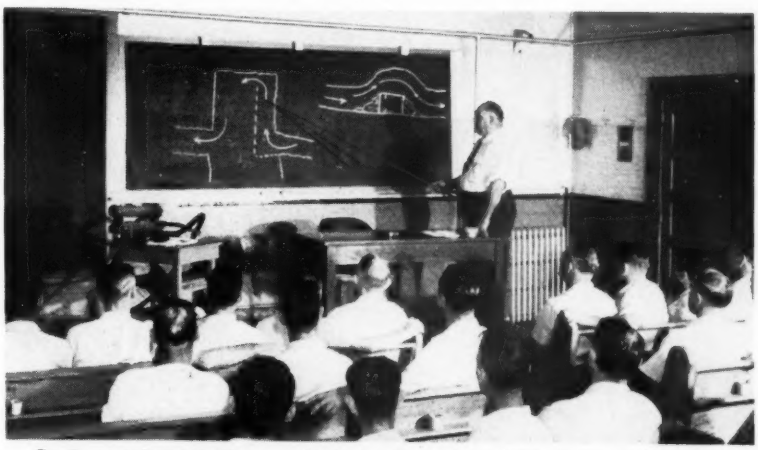
The haulage problem is a major one at any mine. During the past 18 months, Lorado has changed most of its locomotives and mine cars to accommodate greater tonnage from the Lorado operation. The locomotives were modified by installing larger motor units and the mine cars by adding "sideboards" to increase capacity. In factories such a move would be called production planning and control—and that is just what it is to the coal company.

(8) *Industrial engineering has helped streamline paper work.*

Lorado has less paper work today than five years ago—but it all fits together now and carries more important information faster.

(9) *Industrial Engineering has helped quality control by focusing attention on ash, moisture and screenings.*

These figure directly in incentive plans and by tying quality to the incentives, the men who can control coal quality were inspired to do just that.



Good supervisory training meetings can do much to increase the performances of supervisors

Management reserves the right to reduce or withhold bonus payment in the event any unfavorable or avoidable changes result from screening percentages, ash or moisture percentage, etc., which might lower the realization yield.

(10) *Better machinery is bought than formerly, because management now knows what it needs or wants.*

Equipment is not purchased just because it is faster than present machines. It is bought to help the total mining cycle or the over-all cost. The company does not "buy only new" or only used. Engineered studies of the relative cost and resulting benefits are made of any equipment that is felt worth considering, and the one which gives the best earnings is bought if any purchase is made.

(11) *Methods are better because when it is found by time study that one procedure is better than another, a company practice is made, and kept as a practice until a better one is found.*

This helps in a lot of ways. There is better flexibility in moving men around and getting the benefits of standardized tooling and equipment. As an example, it was found that by changing mine projections from a five-heading system to a seven-heading system a third shuttle car could be added and a higher capacity loading machine utilized. These additions along with a few minor changes in preparation increased production on a unit using this method by 25 percent.

(12) *Jobs which are not normal mine expense are done more cheaply because their cost is estimated (with engineered standards whenever practical) and the allowance is then budgeted right into the standard cost.*

Practically all of mine construction such as moving sub-stations, erection of buildings, installing mine fans, grading, etc. is controlled in this manner.

(13) *The company has a better method of evaluating potential key men, because it has better yardsticks than without industrial engineering.*

(14) *Lorado believes (1) in setting salaries and supervisory wages by job evaluation and (2) in using job performance as the basis for merit adjustments in wages and salary administration.*

This gives a realistic spread in supervisory pay rates.

(15) *Machinery maintenance performance is controlled by a preventive maintenance system.*

Daily, bi-weekly and monthly inspections are made of every piece of equipment. These are recorded on regular inspection forms, and, in turn, are reviewed by supervisors. Perpetual maintenance records are kept of each piece of mining equipment, showing parts and labor costs. A regular schedule is maintained of rotated overhaul for all equipment. Delays at the face are consistently

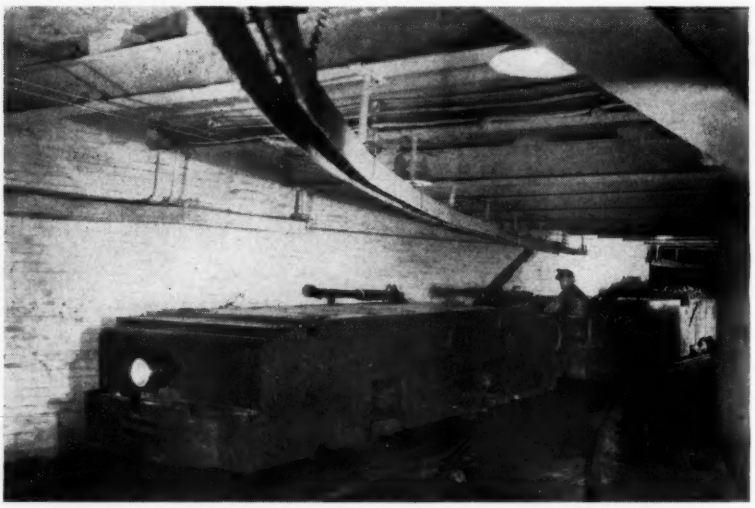
below seven percent of available working time despite the fact that most of the equipment is fairly old, or was purchased used.

(16) ***An orientation and training program is conducted for new supervisors.***

This involves selecting the best available supervisors initially and by briefing and training them over a period of time they become thoroughly familiar with the responsibilities of their respective supervisory positions.

Cost Control as an Effective Tool of Management

Lorado believes that competent people, a good clean organization structure and workable control systems are the key to profitable operations. Cost control does not start with accounting systems and figures. Instead, it starts with setting up the



Industrial engineering is often used to plan haulage and schedule trips

type of functionalized production organization needed to make cost control effective. The coal company's organization is such that responsibilities are segregated and definitely fixed and accounting methods report the cost of carrying out each individual supervisory responsibility provided for in the organizational scheme.

(1) The organization structure is fitted to the needs of the company and jobs are fitted to the organization pattern; then men are fitted to the jobs.

Jobs are never assigned just to conform to a man's talents. Each person has a clearly defined job and is responsible to but one person.

(2) Control is the lifeblood of an economical operation.

Authority is a must for effective control, and a good, functional type of organization is a shortcut to a clean flow of authority A sound organization makes controls work better, makes men work better and makes management easier. This type of organization does not "just happen." It takes careful study, positive action and uncompromising adherence to sound principles.

The company uses a direct costing system—all costs are charged to a control center. Every dollar spent for labor and material at Lorado is based on a budgeted standard. Each week new budgets are issued, based on standard tonnage and authorized special work.

A Daily Operations Report is used that shows the weekly budget for tonnage, labor and material by unit and cost center; the daily and month-to-date production and costs are posted to this report showing a comparison to the budget which reveals any variance from standard. A plus variance indicates dollars spent below budget and a minus variance dollars in excess of budget. Each key man receives daily the portion of this report that will show him how his performance compares to the budget for which he is responsible and has the authority to control.

The use of staff and committee study is a positive aid in cost control. The staff consists of department heads who in turn have committee meetings of key people within their departments. An analysis of the past week's performances and problems; decisions of what to do about them; forecasts of the coming week's performances and problems; any future planning that might be in order and consideration of requests for authorized special work would be the usual agenda for these meetings.

(3) After organizing for cost control, setting the proper objective and measuring performance, there remains one link to be inserted to give the cost control chain its total strenght—personnel.

Enthusiasm without talent will not do a job at minimum cost; talent without enthusiasm is equally void. Incentive will provide enthusiasm—smart management must procure and build talent.

Lorado is building and procuring talent as a routine function of business. Industrial Engineering has magnified the need for management as well as the total work force to keep abreast of the rapid improvements being made in mining methods, record systems and equipment. The best mining conditions available with the most modern equipment in production will not produce the optimum results unless employes know how to do their jobs, want to do their jobs and actually perform the work in a prescribed manner.

Training Plays Its Part

Attendance and membership in industry associations and local mining activities is encouraged by the coal company, which sponsors extension courses in mining and first aid, sends promising employes to formal courses in mining at West Virginia University, and in executive development at the Ohio State University. There is a scholarship program in Mining Engineering for qualified high school graduates whose fathers are employed by Lorado. Summer employment is offered to the recipients of these scholarships and to prospective engineers who are still in school.

Trained, graduate engineers have been hired to implement the effectiveness of the management program. The present work on organization, effective control and a complement of competent personnel will continue.

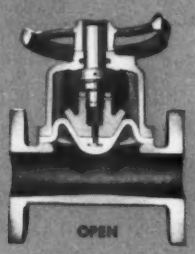
In addition the company is currently looking into the possible use of operations research, linear programming and some other new management tools. Not enough work has been done with these tools to properly evaluate them but they do hold promise of adding to the over-all picture at Lorado.



Whatsa matter? Never seen a toothpick before?

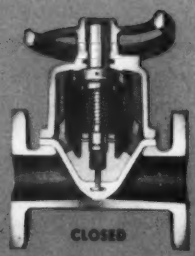
Flow Characteristics
similar to gate valves

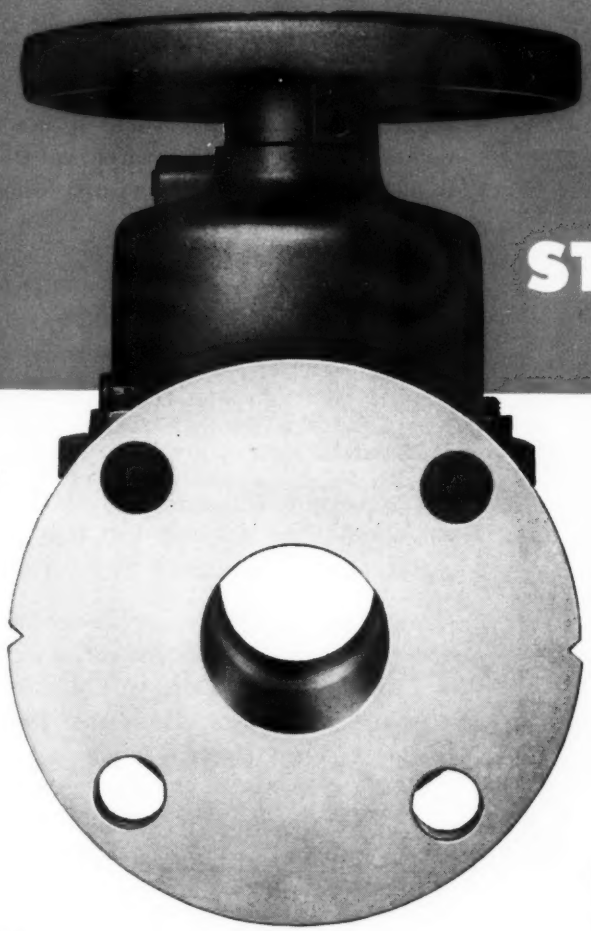
- Streamlined straight-through flow
- Minimum pressure drop
- Handles viscous materials without stoppage
- May be rodded or brushed



Advantages
of a diaphragm valve

- Positive closure even with gritty or fibrous materials
- No pockets to trap sludge
- Bonnet mechanism completely isolated from fluid in line
- Completely self-draining
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how to get the most out of HOLLOW DRILL RODS

The present trend in mining is toward smaller drill holes which require the use of smaller bits and, consequently, smaller hollow drill rod sizes. And that's increased the use of *alloy* steels such as Crucible CA DOUBLE DIAMOND and 4E Hollow Drill Rods.

These new alloy rods have proved themselves on many jobs by lengthening rod life, cutting drilling costs. But they are not unmixed blessings, for they will give a good account of themselves only if they are handled properly. Hammer and tongs blacksmithing isn't enough. Alloy rods demand greater care in forging, upsetting and heat-treating.

Should You Use Carbon or Alloy Rods?

There's no one answer to that question, unless it is *use the rod that best fits the individual job.* Generally, air-feed jackhammers and other small, light drills benefit from the use of alloy drill rods. For alloy rods have greater resistance to fatigue, higher elastic limits – important where smaller rod sizes are used.



Rod Stiffness . . .

Rigidity or stiffness can only be increased by enlarging the cross section of the rod. If you decrease the cross section you'll get more whipping no matter what type steel you use, or how you heat treat it. Therefore, don't use a ⅞" hexagon alloy rod when you've been using a 1¼" round carbon rod, unless an increase in flexing and less stiffness is unimportant.

Abrasion Resistance . . .

The higher the hardness the better a drill rod will stand abrasive wear. Alloy rods have the advantage in this respect, for they can be heat-treated to higher hardnesses than can carbon rods.

Notch Effect . . .

Notch effects caused by failure to overlap heats in treating shanks, or those caused by careless handling, chain marks or corrosion pits all cause rod failure. Alloy rods are more resistant to these nicks or notches than carbon steels, but when they do occur failure can be more rapid.

The answer to better drilling is simply this: choose the right drill rod, and then give it reasonable and proper care.

And for the *right* carbon or alloy hollow drill rods – in the sizes, shapes, and grades you need – Crucible is the place to go. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America



This Bucyrus-Erie 1050-B stripping shovel is stripping overburden in an Ohio mine.

Familiar answer to an old problem...

As overburden goes deeper and deeper, the need becomes greater and greater for stripping methods that will hold costs down to reasonable levels. An effective and familiar answer to the problem is a Bucyrus-Erie stripping shovel such as this 1050-B.

These machines are capable of moving really big yardages at low cost per yard. They have the long working range and time-saving maneuverability to work effectively. Just as important, the simple, field-proved design helps keep operating expense and maintenance to a minimum.

If you're looking for a solution to the problem of rising stripping costs, check into the economical advantages that Bucyrus-Erie stripping shovels and draglines can bring you. Bucyrus-Erie builds these machines in capacities up to 65 cu. yd.

79L56C

BUCYRUS ERIE

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TIMKEN® bearings help get the ore from ship to shore in a hurry



THE JEFFREY MANUFACTURING COMPANY'S heavy-duty idlers with Duoflex seal used by the Pennsylvania Railroad. Timken tapered roller bearings are on the troughing and return idlers.

THIS conveyor system is installed at the Pennsylvania Railroad's ore-unloading pier in Philadelphia. It handles up to 3,300 tons of ore per hour on each of two 54″ belts traveling at more than 500 feet per minute. Timken® tapered roller bearings were selected for the Jeffrey troughing and return idlers used throughout the entire system.

Timken bearings are the only tapered roller bearings proved by 25 years or more of service in heavy-duty conveyor installations using the popular dead shaft construction. Line contact between rollers and races gives Timken bearings high load capacity. And by using Timken bearing sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost you *less* than the smaller sizes you'd normally use.

You get longer roller and belt life with Timken bearings because their true rolling motion and extremely smooth surface finish mean less friction. Result: less sliding and scuffing between idlers and belt.

When it comes to buying or building any kind of machine, your best bet is Timken bearings. We do everything possible to make sure they give you full value. In fact we even make our own steel. We're the only bearing manufacturer in the country who does. Make sure the bearings in your machinery are stamped with the trademark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



This symbol on a product means its bearings are the best.

See us at the

1956 MINING SHOW

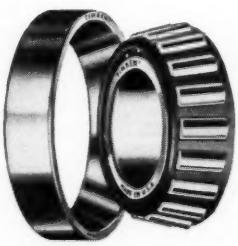
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Many railroads built much of their capacity primarily to carry coal and on many railroads coal has always been the biggest single commodity hauled

The Railroads and The Coal Industry

By WALTER W. PATCHELL
Vice-President—Research and Development
The Pennsylvania Railroad

A Prominent Railroad Man Outlines the Effect of Anticipated Increases in Coal Production on His Industry With Regard to Providing Additional Transportation Equipment

THE railroad and coal industries have worked together productively for over a century, and together we have, I believe, an even more productive future ahead of us. We all know the long historical relationship between the two industries, and their present and future importance to the national economy and national defense. Many railroads, including the Pennsylvania, built much of their capacity primarily to carry coal: and on many railroads coal has always been the biggest single commodity carried. Generally when coal was prosperous the railroads were prosperous, but when coal was in trouble the railroads were in trouble. Coal's dark days of 1954 are a typical example. That year should have been one of the Pennsylvania Railroad's best postwar years but it was one of its worst. I don't think I'll ever forget that year: it seemed to me that every time I wanted to see either our president, Walter Franklin, or Jim Symes, they were working up another protest to Washington against the dumping of foreign residual oil on the U. S. fuel market, or the cut-price squandering of natural gas as boiler fuel. They kept making the point, as other railroad men and coal people kept making the point, that in peace or in war, coal is the most readily expansible source of energy that America owns, and that railroads are our most readily expansible source of transportation—and that neither industry can be really strong and prosperous without the other being really strong and prosperous. Both industries must be kept strong and prosperous in time of peace if they are expected to assume the necessary load in time of war.

To you and to me that genuine and mutual indispensability of our two industries seems self-evident. It is always a shock to me, as I am sure it is to you, that this fact has to be pointed out repeatedly to so many of our national leaders. It is our duty as citizens to keep fighting in the national interest, for the equal competitive treatment that will keep our two industries really and permanently strong and able to properly assist in protecting the Nation.

Railroads' Investment in Coal

Let's look now at the business relations between our two industries. The railroads have somewhere between 2¼ and 2½ billion dollars invested in coal-transportation facilities. This represents somewhere around one-tenth of the railroads' total investment in road and equipment.

Because what I shall be saying from now on reflects attitudes and opinions of a Pennsylvania Railroad officer—and may or may not reflect the attitudes and opinions of the managers of other coal-carrying railroads—I'd better outline the mutual interdependence between the Pennsylvania and the coal industry.

We are one of those railroads whose creation a century ago, and

subsequent expansion, was based largely on coal. Ten of the 13 states we operate in produce coal. Last year we carried 1,100,000 revenue carloads, more than half of it from connecting lines. This meant that we moved about one-seventh of the total volume of coal produced, and about one-sixth of all that was moved by railroad. Coal accounted, as it normally does, for one-third of our tonnage and one-sixth of our freight revenue.

We own about 52,500 serviceable hoppers and 37,000 gondolas, and have ordered and are in the process of receiving 4800 new hoppers and 1400 new gondolas. These will cost about 52 million dollars, and bring our investment in coal handling equipment—excluding motive power, tracks, and so on—to about 300 million dollars. And if we were to include motive power, tracks, piers and other facilities, the investment would exceed half a billion dollars. If we had to buy it all today, it would cost over a billion dollars.



The railroads have somewhere between 2¼ and 2½ billion dollars invested in coal transportation facilities

Incidentally, the 52 million dollars being put into new hoppers and gondolas is 11 million dollars more than our net earnings for 1955. This means that we are spending in one year more for coal handling equipment than we earned in a fairly good year, and 2½ times the 20 millions we paid out that year to our stockholders in dividends. This is prima facie evidence that the Pennsylvania has faith in the future of your industry.

The Pennsylvania used to be the biggest single consumer of coal anywhere in the world—and as late as the war years we used 16 to 19 million tons a year. We are still the second largest rail consumer of coal, being exceeded only by our friends of the Norfolk and Western. Last year we bought 1¾ million tons—amounting to just short of seven percent of our dollar purchases. We also consumed just under two billion kilowatt hours of electric power, accounting for another million tons of coal. When we add this tonnage to the tons directly consumed, we are still the best railroad customer of the coal industry. Our coal consumption naturally was reduced by dieselization—which we resisted as long as we could. As late as 1946, we were still ordering steam locomotives, and we were still maintaining a very large fleet of hopper cars used exclusively to handle company coal, which produced no revenue. Naturally, this fleet disappeared with the steam locomotive.

To help finance the research for coal-burning locomotives that could compete with diesel power, both physically and economically, we contributed a total of $1,181,000 to the Locomotive Development Committee of Bituminous Coal Research, Inc. This was more than any of the eight other participating railroads contributed—and a bit more than the total contribution of all five participating coal companies. We considered that expenditure an investment in coal's future as well as ours; we look on our present program for 52 million dollars worth of new hoppers and gondolas in the same way.

Future Transportation Needs

In the light of all that background—and in the spirit of recognizing our mutual stake in solving the problem—I now come to the specific question you asked me to discuss. You expect your output by 1970 to run at 750 million tons a year; and you ask me where the additional transportation is going to come from.

Putting present coal production at about 500 million tons, you are expecting an increase of 250 million tons by 1970. At present some 70 percent of coal production is moving by rail. Assuming that that percentage will continue to hold, the basic question becomes:

Where will the rails get the additional facilities and equipment to handle 175 million more tons of coal a year?

Let's start with hoppers. Including a normal five percent for shopping, the additional load would require, we estimate, 118,000 more hopper cars. Based on the 1956 price at about $8150 per car, the cost of these hoppers would be $956,000,000. Our experience with big car fleet additions shows that they require additional motive power costing about 25 percent of what the cars cost. Assuming this 25 percent power requirement, we estimate that $240,000,000 would have to be spent on locomotives—again using 1956 prices. Adding the hopper and motive power requirements, we get a total of about $1,200,000,000 for the new cars and locomotives that would be needed. That, of course, does not include the cost of new side track facilities, branches, yards, handling facilities, and so on.

In 1939 a new 70-ton hopper cost about $3000; in 1946 it cost about $4400; today it costs $8150. It is hard to believe that something which has almost tripled in price in the past 17 years will not go up at all in the next 15—which means that the $1,200,000,000 we have been talking about is just a base figure. However, it will do for the purpose of our next question, which now is:—

Where To Get The Money?

Where is this money to come from?

As mentioned before, the Pennsylvania handles about one-sixth of the coal tonnage that moves by railroad. We have every intention of maintaining that share and increasing it if we can. This means that at least one-sixth of the billion two—or 200 million—would normally be financed by the Pennsylvania. In the ten years since the close of World War II—1946 through 1955—the Pennsylvania has earned a total of 245 millions. Even at 1956 prices, which we must realistically accept only as base figures, the totals are astounding. They state that our share of additional hoppers and locomotives that will be needed will cost over 80 percent of what our whole railroad has earned during the greatest peace-time boom in industrial history!

Now where in the world are we going to get that kind of money to take care of just one commodity—important though that commodity may be? Remember that if coal volume is going to increase by 50 percent in the next 15 years, production of other commodities may be expected to increase also.

Frankly, there is only one logical place to get the money for expanding coal transportation facilities and that is from earnings on the coal side of our business, plus borrowings backed by the expected earnings from that equipment.

Freight Rates

At the risk of seeming to start off defensively, I must tell you in all frankness that coal transportation does not carry the passenger and L.C.L. (less than carload lots) deficits. That charge came up some months ago before the I.C.C., as it periodically does. We submitted data, which is yet to be controverted, demonstrating that even excluding the passenger and L.C.L. deficits, railroad coal traffic was not paying its way on a full cost basis, including its share of overhead and a proper return on investment. Incidentally, the basic figures used in assembling this data are not ours; they were produced by the I.C.C.'s Cost Finding Section and assembled on the basis of their formula. Specifically, the figures demonstrated these two economic facts:

1. Even excluding the passenger and L.C.L. deficits, coal moving in so-called "U. S. to U. S." traffic—that is, coal moving over the nation as a whole—was paying only 95 percent of its way on a fully allocated cost basis.

2. Even excluding the passenger and L.C.L. deficits, coal moving within so-called "Official Territory"—that is, within the northeast quadrant of the nation—was paying only 97 percent of its way on a fully allocated cost basis.

In both cases, remember, this was excluding the passenger and L.C.L. deficits. But, as I stated before, it did include, as it should coal traffic's share of the rest of company overhead, and a proper return.

Costs Going Up

You are familiar with how your own labor and other costs have risen with post-war inflation. It so happens that labor demands on you are dramatized in the press. We get waves of crushing demands, too; however, they come from a multitude of unions and therefore don't make as much splash in the press and also they generally follow in the wake of your settlements. Just as you do, we find the prices of practically everything that we buy increased whenever our suppliers raise wages.

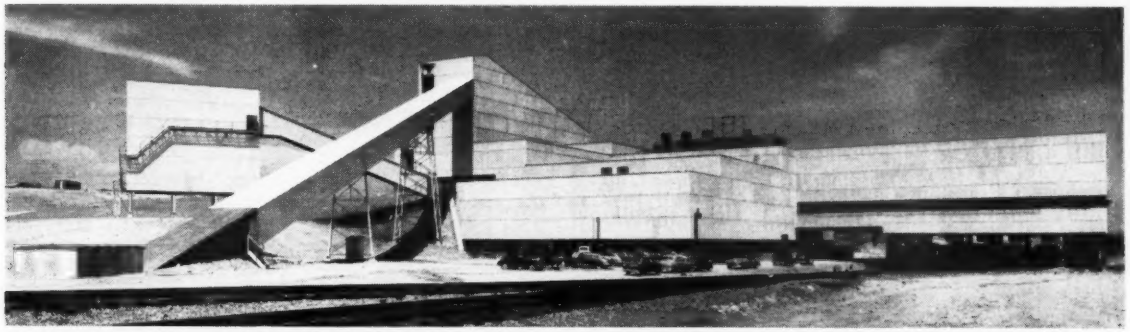
On that subject, may I give you a few figures on the Pennsylvania? You are aware of the wave of wage and benefit increases that swept industry generally in 1955 and early in 1956. To meet that situation you raised your coal prices—including prices to us, and we don't blame you for so doing.

However, on our railroad alone, on an annual basis, that wave of increases will cost us $51,200,000 annually in additional wages and benefits, and $8,200,000 in increased cost of purchases at our present level of business. That is an increase of $59,400,000 a year—almost 1½ times our net earnings for last year. To help off-set that increased cost, based on 1955 volume we expect to derive approximately $5,500,000 from the 15-cent-top increase in coal rates granted in March. In other words, the commodity which makes up one-third of our tonnage will off-set only one-eleventh of our increased costs.

I might mention, too, that between April 1952, when we received our last pervious rate increase, and March 1956, when Ex Parte 196 went into effect, our annual wage and benefit costs went up by $87,500,000 and our materials costs by $14,000,000—a total of $100,000,000. In those four years of our constantly increasing costs, coal rates did not go up even one cent.

You may wonder how we managed to stay in business in the face of such increases in cost with no rise in rates. We did it through greater efficiency, as represented by dieselization, longer trains, mechanized maintenance procedures and so on, and by suffering a lower rate of return as well as by severe reductions in maintenance expenditures. This was especially true as the cost increases went on and we felt the effects of the business recession following the termination of hostilities in Korea. It was only when we found that the 1955 round of increased costs could not be met in any other way that we put in for a seven percent increase through Ex Parte 196. As you know, we got only six percent with maximums on certain commodities, including coal and coke, making the average increase 5.5 percent. As I say, we asked for this raise because we had to; if we had wanted raises just to get in on post-war prosperity, we wouldn't have waited since April 1952.

This self-restraint did not come from any special goodness of heart on our part. It came from the standard railroad philosophy that we can thrive only on movement of goods, both raw and finished at rates which will encourage volume. Otherwise, as we know only too well, the plant or utility seeks to "get on top of" its raw materials—in your case, builds factories or power plants at or near the pit mouths. Hence, as I say, our constant pressure upon ourselves to keep our rates, including our rates on coal, down to the lowest possible level in the face of inflation. Needless to say, we'll never get rich doing that. Last year, our best since the war, netted us less than 3 per cent on our investment.

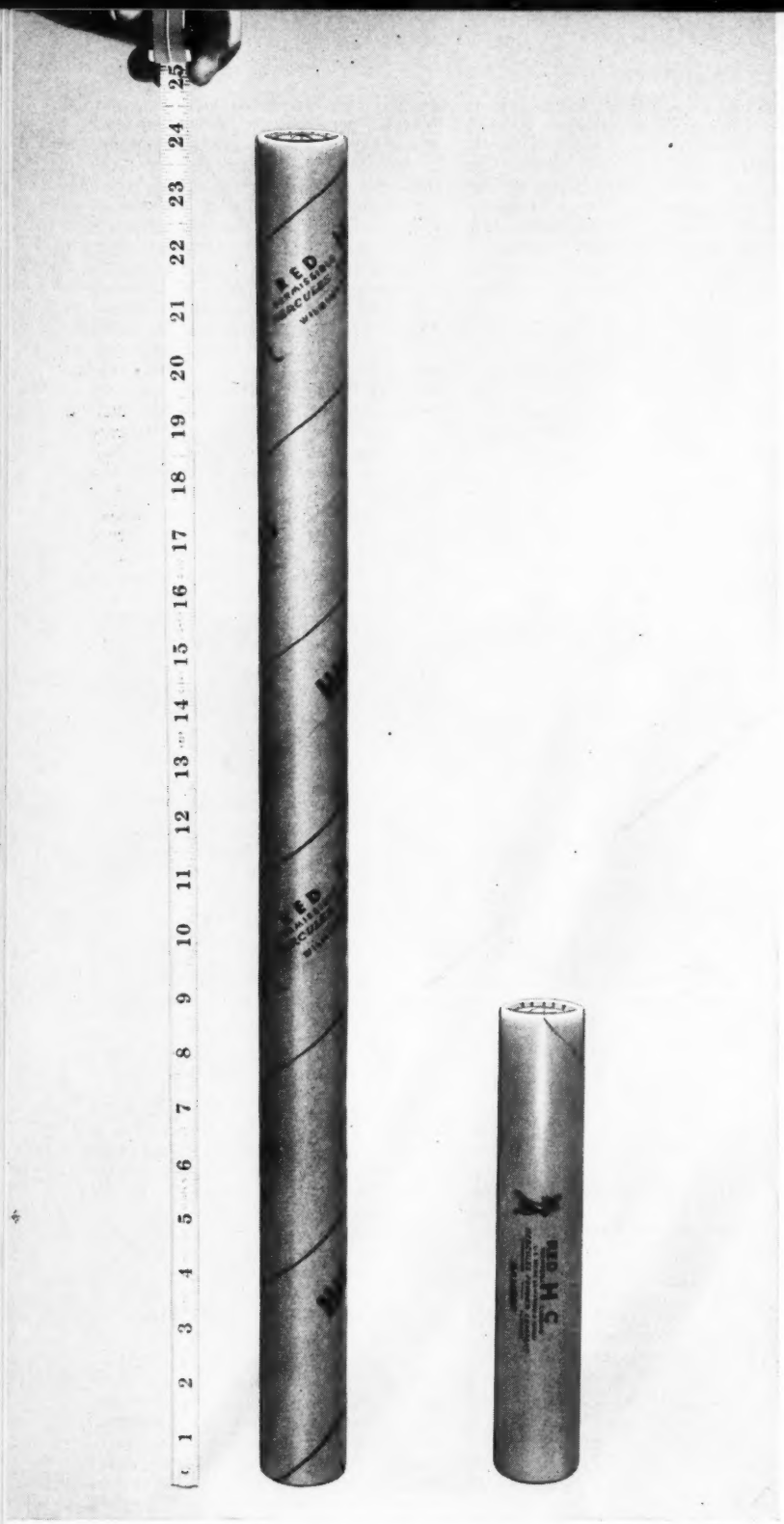


Preparation plant served by railroad. Various economists have estimated that our annual coal production will reach ¾ billion tons by 1970

In Conclusion

Because I got onto the subject of rates, I hope you don't think that is really what I came here to talk with you about. But I simply had to make clear that there is only one way we can get the money—$200,000,000 at 1956 prices—to provide the additional cars and locomotives I hope you will be asking the Pennsylvania to provide by 1970. That is to earn some of it, and earn the ability to borrow the rest of it—on coal traffic.

No one could be happier than we are at your success in raising yourself, by your own efforts and courage, from an industry that was slipping to one that is now going ahead into a bright future. The railroads have been going through the same mill: I only hope we can do as effective and courageous a job as you have. We are going to do everything in our power to help you realize your full potential—not only because of friendship in working together, but because it will help us realize our full potential, too.



E LONG AND THE SHORT OF IT . . . Here is a new Hercules "King-Size" permissible cartridge—24 inches in length—shown alongside the same grade in the conventional 8-inch size.

NOW... "KING-SIZE" PERMISSIBLES

Hercules permissible powders packed in "King-Size" cartridges are now available for use in coal mines. Field tests of these new "King-Size" cartridges show that they have many advantages, some of which are:

- **A continuous column of permissible powder in bore holes minimizes misfires and reduces the hazard of unshot powder in the coal.**
- **Predetermined cartridge weights effect economies in the powder consumption.**
- **Uniformity in loading produces uniform breakage.**

Hercules "King-Size" cartridges are supplied in most permissible grades, in lengths from 12 to 24 inches and in diameters of 1¼ to 2 inches.

Our representatives are ready to discuss your explosives needs and to give more information on how the new "King-Size" cartridges can do more work for you at lower cost.

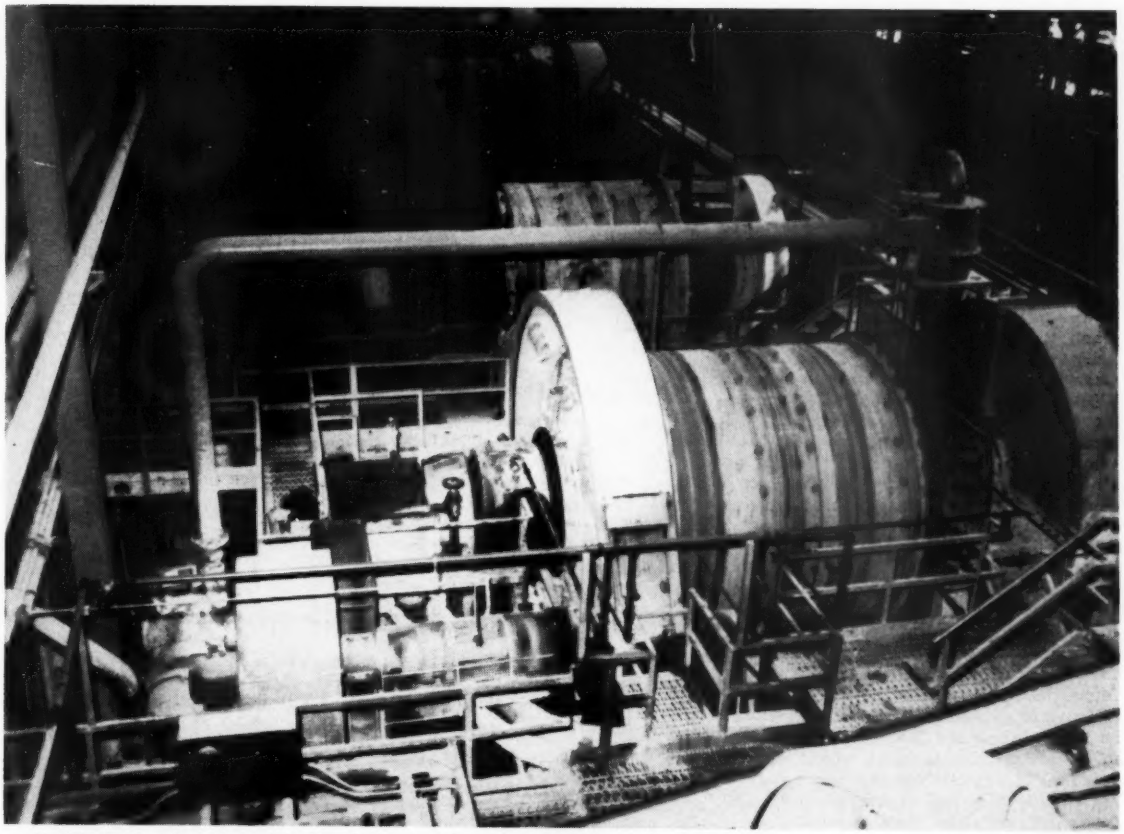
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XR55-8

HERCULES

Cyclone Classifiers at Morenci



A 30-in. wet cyclone is used in closed circuit with a 10 x 10-ft Marcy ball mill. Major problem to be solved in this application of the cyclone classifier is excessive wear

Experience with 20- and 30-in. diam cyclones as classifiers in primary grinding and concentrate regrinding circuits is ably presented. Pertinent design and operating data are included, together with typical results

By J. E. PAPIN and R. C. BARR
Concentrator Superintendent Metallurgical Assistant
Morenci Branch
Phelps Dodge Corp.

IT WAS recognized several years ago that cyclone classifiers might be useful in improving classification in the concentrate regrinding sections of the Morenci concentrator. The standard classifiers initially installed had proven to be inadequate and space limitations restricted the remedial measures. After some experimentation with small cyclones, a 12-in. diam cyclone of conventional design was fabricated and a series of tests were run with this unit in closed-circuit with a regrind mill. That cyclone gave good classification on as much as 600 gpm of normal regrind feed material at feed inlet pressures from 10 to 12 psi (gauge). Inasmuch as the capacity developed was not adequate to serve one regrind mill, consideration was given to means of obtaining additional capacity. Two alternatives were presented: namely, use of additional 12-in. cyclones or development of a larger cyclone.

Larger Cyclones Built

It was estimated that a 20-in. diam unit would have enough through-put capacity and a unit of that size was built and installed. Subsequent testing confirmed estimates and the 20-in. cyclone was adopted as the standard classifier for the extension plant concentrate regrinding units which handle approximately 43 percent of the concentrate produced. The final installation, as shown in Figure 1, was accomplished in May 1954 and incorporated a common cyclone feed tank. This tank in conjunction with an adjustable cyclone feed gate permits smooth operation of the classifiers at a nearly constant feed inlet pressure.

The result obtained in the extension plant dictated the adoption of the cyclones in the regrinding section of the original plant. To handle the larger volumes of material in that plant, it was decided to try 30-in. diam cy-

clones. In December 1954 one 30-in. cyclone unit was in operation, and with the installation of two more such units by April 1955 all five regrinding units in the Morenci concentrator were equipped with cyclone classifiers. Figure 2 shows the arrangement of the final installation for the original plant concentrate regrinding section.

Table I gives pertinent operating data and typical results for both concentrate regrinding sections with cyclone classifiers in operation.

Coarser Sizing of Products

Regarding the data included in Table I. some mention should be made about the coarser sizing of milling and classification products in the original plant retreatment section. In the years prior to the installation of cyclone classifiers it was determined that each 8½ by 12-ft regrind mill received not more than 300 tons of solids per 24 hrs. Under existing operating conditions, the feed tonnage to each mill is at least double that and often, with one mill operating in the original regrinding section, the tonnage to that mill is three times as much as before. To compensate for the heavier mill loads, the regrind mill ball charges were converted from a combination cast iron ball and scrap ball load to a 1¼-in. forged steel ball charge. After the ball charges were converted, it was found that the extension plant regrind mills were grinding as fine a product as before when the feed tonnage was much lower. The original plant regrind mills when operated singly have not produced as fine a product as before; however, the resulting cyclone overflow at 75 percent minus 325 mesh is as fine as the earlier classifier overflows were. Under extremely heavy load conditions, a second regrinding unit is operated in the original plant and then all products approximately duplicate those from the extension plant.

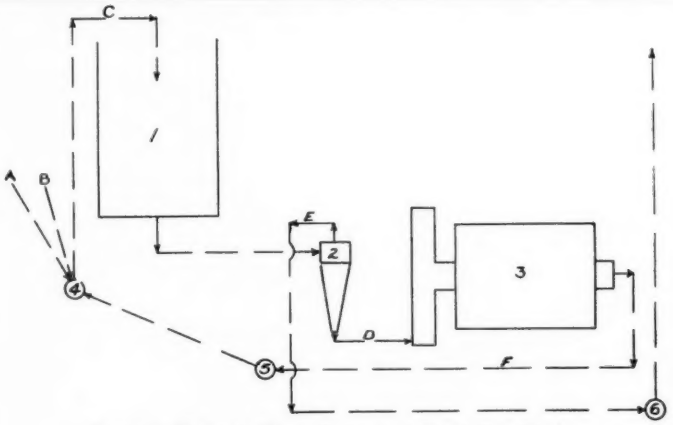


Figure 1. Extension Plant Concentrate Regrinding Section

1. 1—10′-diam x 15′ Feed Tank
2. 2—20″-diam x 20° Cyclones (one operating)
3. 2—8½′ x 12′ Ball Mills (one operating)
4. 2—8″ Centrifugal Pumps (one operating)
5. 2—3″ Centrifugal Pumps (one operating)
6. 4—8″ Centrifugal Pumps (two operating)

A—Secondary Rougher Flotation Concentrate
B—Cleaner Flotation Tailing
C—Regrind Feed
D—Cyclone Underflow
E—Cyclone Overflow
F—Ball Mill Discharge

Operation Characteristics

The operation of the regrinding units with cyclone classifiers has proved to be quite easy. A constant feed pressure of 10 psi (gauge) is maintained at the cyclone by adjusting the feed volume with a sliding gate located immediately ahead of the cyclone feed chamber. Variations in underflow solids are compensated for by adjusting the size of the underflow spigot opening, and water is provided at the head of each mill to maintain the prescribed pulp solids within the mill. Under most conditions the underflow spigot is adjustable over a wide enough range to make the addition of any water unnecessary.

In summary, it can be stated that the adoption of cyclone classifiers for the concentrate regrinding sections has made possible the reduction of operating regrind mills used per mill day from 3.8 to 2.2. This has materially reduced the steel consumption and power requirements for such duty. Maintenance on cyclones and auxiliaries has been minor and considerably less than was the case with the standard classifiers. Those benefits have been achieved without any sacrifice in regrind product character.

TABLE I

A. Cyclone Dimensions

	Original Plant	Extension Plant
Cyclone Diameter	30″ ID	20″ ID
Totally Included Cone Angle	20°	20°
Feed Aperature (equiv. diam)	8¼″	7″
Vortex Finder	7½″ ID x 21½″	7″ ID x 19″
Overflow Pipe	12″ ID	10″ ID
Underflow Spigot	4″ ID (max)	3″ ID (max)

B. Operating Data—
One regrind unit operating at feed inlet pressure of ten psi (gauge) in each regrinding section.

Description	Tons Solids Per 24 Hr	% Solids	GPM	Sizing Analysis—% +200	+325	—325
Regrind Feed						
Original Plant	1250	10.0	1925	30.0	15.0	55.0
Extension Plant	950	10.0	1450	30.0	15.0	55.0
Cyclone Feed						
Original Plant	2065	15.0	2025	27.0	22.0	51.0
Extension Plant	1615	15.5	1530	25.0	19.0	56.0
Underflow						
Original Plant	815	67.0	95	60.0	25.0	15.0
Extension Plant	665	68.0	75	55.0	30.0	15.0
Mill Discharge						
Original Plant	815	65.0	100	22.0	33.0	45.0
Extension Plant	665	66.0	80	17.0	26.0	57.0
Overflow						
Original Plant	1250	10.0	1930	6.0	19.0	75.0
Extension Plant	950	10.0	1455	4.0	12.0	84.0

	Orig. Plant	Ext. Plant
Approximate Circulating Load	65 %	70 %
Efficiency of Classification at 325 mesh	57.5%	67.5%

Testing of the Cyclone in A Primary Grinding Circuit

A recently reported use of the cyclone classifier in primary milling circuits elsewhere led the Morenci concentrator staff to investigate the use of a cyclone in closed-circuit with a primary grinding mill. The initial test in February 1954 was made with a 20-in. diam cyclone to which was fed one-half of the mill discharge product from one 10 by 10-ft primary

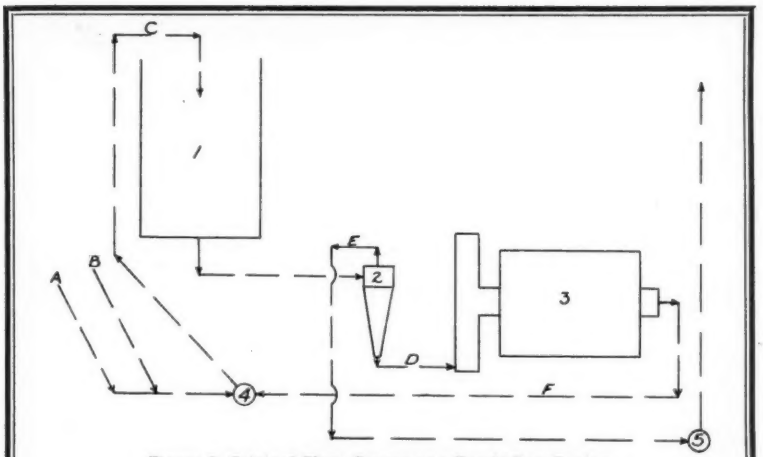


Figure 2. Original Plant Concentrate Regrinding Section

1. 1—10'-diam x 15' Feed Tank
2. 3—30"-diam x 20° Cyclones (one or two operating)
3. 3—8½' x 12' Ball Mills (one or two operating)
4. 3—8" Centrifugal Pumps (two operating)
5. 3—8" Centrifugal Pumps (two operating)

A—Secondary Rougher Flotation Concentrate
B—Cleaner Flotation Tailing
C—Regrind Feed
D—Cyclone Underflow
E—Cyclone Overflow
F—Ball Mill Discharge

Excessive Abrasion Poses Big Problem

The abrasive character of the primary mill pulp was not long in expressing itself in the form of worn out pump parts and cyclone sections. At the apex of the cyclone, the ⅝-in. thick boiler plate wall holed through in 48 hrs, and the first pump runner lasted only 137 hrs. Here then, was, and is today, the major problem to be solved in this application of the cyclone classifier at Morenci.

The wear problem has been attacked from the standpoint of equipment design and through the use of different materials. Lining the inside of the cyclones with rubber has given the best cyclone life to date. Hard metallic alloys have proved superior to rubber for use in the several pumps tested. At the time of this writing, it must be stated that, though considerable improvement has been made, the problem of excessive wear has not been satisfactorily solved.

The major control utilized in the operation of the primary cyclone classifiers is dilution of the feed pulp. An underflow spigot of adjustable diam is desirable to control the low and high extremes in tonnage and volume through-put. The mill operators have learned to anticipate overloading or underloading of the grinding mill by the sound of the ball action, the power input, and the consistency of the mill discharge product. One objectionable feature of the cyclone classifier in primary milling circuits is that the overflow, being under pump pressure, can carry over very coarse oversize should the cyclone become badly unbalanced, for instance, a choked underflow spigot. Though the above-mentioned condition has seldom occurred, it is felt that additional screens or traps ahead of flotation might be required.

Testing of the liquid-solid cyclone as a classifier in the Morenci primary milling circuit is continuing.

ball mill. Results were encouraging in that the classification was excellent, the overflow solids were several points higher than the normal classifier overflow solids, and the solids content of the underflow was high enough for optimum milling conditions.

On March 15, 1954, a 30-in. diam cyclone which had been fabricated locally was put into operation and proved capable of taking the total mill discharge product from one primary mill. An eight-in. centrifugal pump was used to deliver the mill discharge product to the cyclone at a pressure of about 10 psi (gauge).

Table II lists cyclone dimensions and shows average operating data obtained over a 16-month period.

TABLE II—30-IN. DIAM CYCLONES IN CLOSED-CIRCUIT WITH ONE 10 BY 10-FT PRIMARY BALL MILL AT THE MORENCI CONCENTRATOR

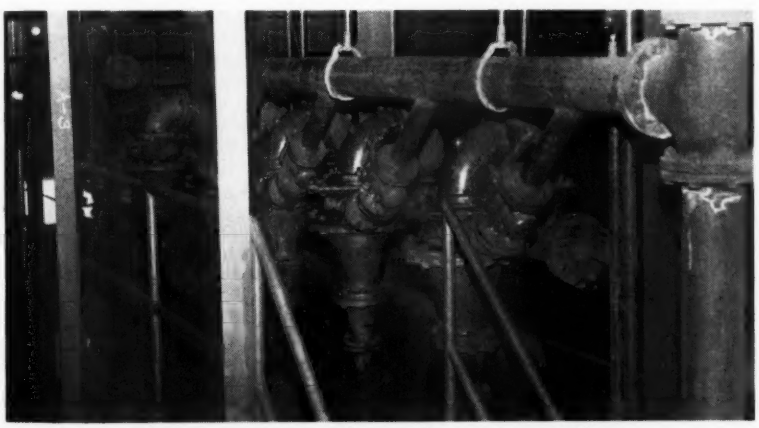
A. Cyclone Dimensions:

Cyclone Diameter	30-in. ID
Totally Included Cone Angle	20 degrees
Feed Aperture (equiv. diam)	10-in.
Vortex Finder	8-in. Diam X 21½-in. Long
Overflow Pipe	12-in. Diam
Underflow Spigot	5-in.—6¼-in.

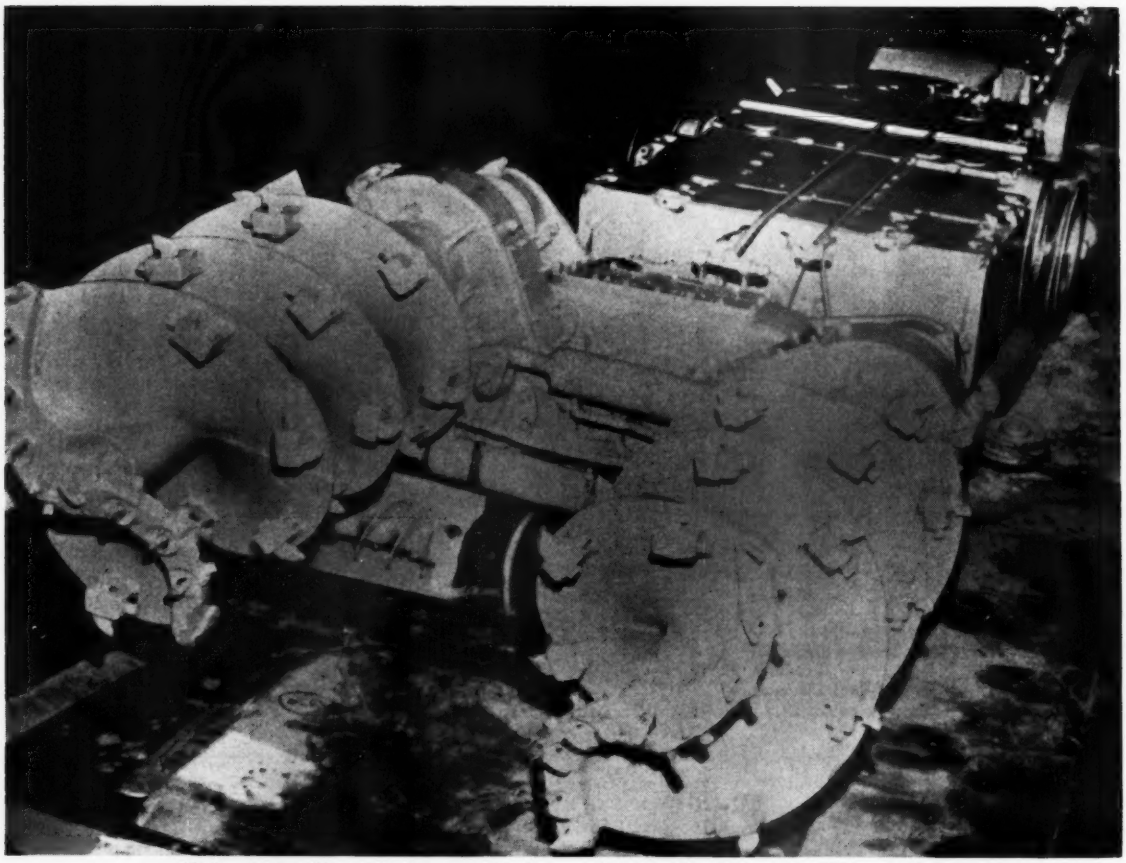
B. Operating Data:

Description	Tons Solids Per 24 Hrs	% Solids	GPM	Sizing Analysis—% +35	+65	+100	+200	−200
New Feed	1830	...	...	84.4	3.6	1.5	2.0	8.5
Mill Discharge	10980	71.4	1385	41.9	24.8	8.0	9.4	15.9
Cyclone Feed	10980	59.1	1910					
Underflow	9150	78.0	975	52.3	25.3	7.2	7.9	7.3
Overflow	1830	27.0	935	0.5	8.9	13.4	17.7	59.5

Circulating Load: Approximately 500%



Battery of cyclones used at another western operation



Mechanical trouble is said to be practically nonexistent on this continuous mining machine

The Wilcox Miner

Latest Entry in the Field of Continuous Mining is a Unit Designed for Thin Seams. Here is How One of the First Coal Companies to Use the Machine Views Its Performance

By ROBERT N. MORRIS
Assistant to Vice-President—Production
C. H. Mead Coal Co. Division,
The North American Coal & Dock Co.

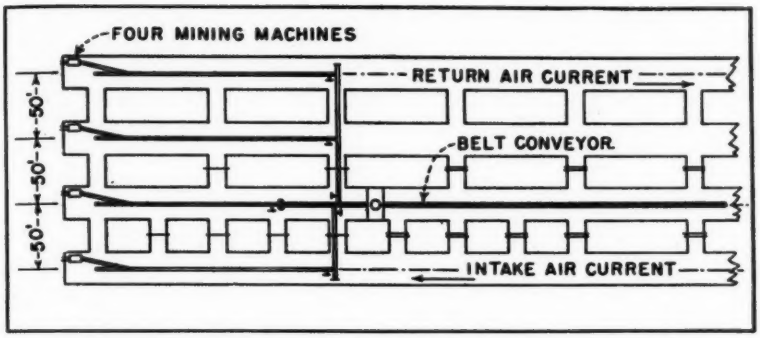
MANY coal mining men well know that the application of mechanical equipment to the mining of coal seams under 40 in. in thickness has been a difficult task. The height limitation of low seams has presented a problem in design which has long baffled equipment manufacturers in their attempt to build into mechanical coal loading machines the necessary strength and power yet maintain sufficient clearances and maneuverability. With this problem ever-present, underground coal mining has become a highly mechanized industry on the whole, with mechanical loading devices playing a predominant role. The natural result of this contrast is that coal companies operating mines in low seams where mechanical loading equipment has not proven satisfactory have faced a very serious competitive problem in recent years, and many have been forced out of the picture.

The Versatile Shortwall

One type of machine which has proven itself adaptable to almost any underground condition, is the shortwall cutting machine. This unit, working with equal effectiveness in low coal as well as high, was for many years the only mechanical application to the mining of coal from the face. The shortwall cutting machine has been developed over these many years to the point that it is relatively trouble free and its operation well known by practical mining men. It is indeed strange that in the furious activity in the development of continuous mining units, only recently has the principal of the shortwall been utilized in the design of a continuous mining machine. This continuous miner, based on the shortwall principal, is truly a natural for the mining of low seams and will be a boom to operators mining 28 to 40 in. of height.

Description of Wilcox Miner

The machine referred to is known as the Wilcox Miner. It was invented by A. G. Wilcox and is manufactured by the Wilcox Manufacturing Co., Raleigh, W. Va.



Entry development in Pocahontas No. 3 seam, where coal averages 36 in.

This miner consists principally of three parts; the head, which utilizes twin augers for the mining operation; the central body, which is a converted shortwall cutting machine and which powers the mining head; and the conveyor section, which delivers the mined coal to the haulage system.

The head section of the unit is composed of a simple gear train which drives twin augers protruding to the front of the machine. The augers are 24 in. in diameter and 42 in. in length. These augers are each equipped with ten cutter bits on the front end and 20 bits spaced along the auger periphery. The augers rotate in opposite directions with the bottom edge of each turning toward the center of the machine so that the mined coal is gathered for pick-up by a conveyor within the machine. It is well to note at this point that except for the sump cut the Wilcox Miner is not a typical boring machine but rather a ripping type of unit, since in mining the face after sumping the machine is moved across the face in a direction perpendicular to the axis of the machine. Additionally, the head section contains scrolls, direct driven from the conveyor foot-shaft, which gather the mined coal to the conveyor for removal from the face. The augers are positioned vertically by means of hydraulic jacks which afford adjustment to any mining height from 28 to 42 in. and by mechanical drive the whole head section is oscillated continuously in line with the machine with a stroke of 1½ in. The purpose of this reciprocating motion is to avoid coring between bits on the solid face being mined.

The central section of the unit consists principally of a Goodman 512 Shortwall Cutting Machine which has been altered to adapt it to this new design. The major alterations consist simply of an extended armature shaft which drives the head mechanism, the removal of the cutter bar which is replaced by the conveyor through the machine, and a new extended base plate onto which the head mechanism is attached. Other features incorporated in the alterations are hydraulic push-button friction controls on each rope drum, hydraulically operated tilt jacks to control the head elevation, and a new and larger hydraulic system. The conveyor which collects the mined coal and delivers it to the rear of the machine is 18 in. wide and is powered by a five-hp motor through a V-belt drive and reducer.

Attached to the central section of the machine by a swivel joint is the tail conveyor which is separately powered by a five-hp motor and is a bridge-conveyor type of unit. At the discharge end of this conveyor a dolly, which is swivel connected, rides on chain conveyor pans which in turn transport the coal away from the machine and out of the working place.

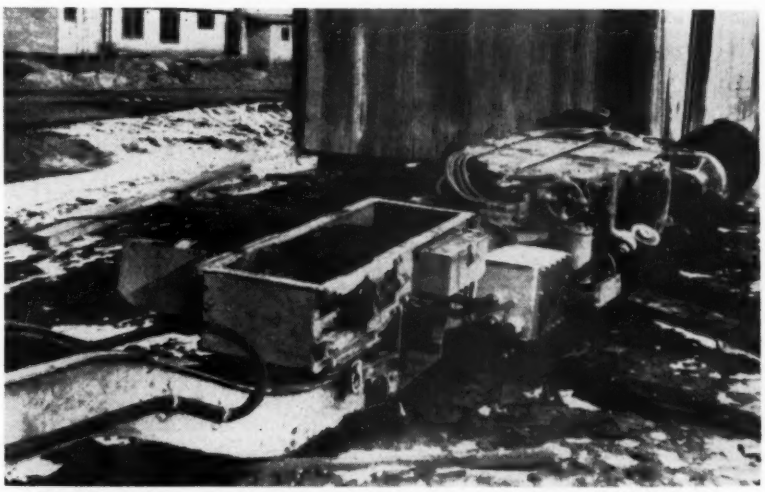
The head and center section of the machine is approximately 21 ft long and is rigid for that length, while an additional 22 ft 6 in. of length is incorporated in the bridge conveyor unit so that the over-all length is 43 ft 6 in.

The C. H. Mead Coal Co. Division, The North American Coal and Dock Co., placed the first production model of the Wilcox Miner in service in October 1955 and since that time has learned a great deal about not only the machine's capabilities but also methods of operation. The following description of the method of operation is that developed at C. H. Mead Mine No. 3 in Raleigh County, West Virginia, where presently two machines are being operated quite successfully.

Face Cycle

An operating crew consists of three men, an operator and two helpers. One of each of the two helpers works on either side of the machine and their job is principally concerned with the setting of steel safety jacks and machine jack pipes, and clean-up work. The machine is customarily sumped up along the left hand rib with both augers lowered to the floor. The two jack pipes are set on each side of the auger head near the face so that by using the ropes from both drums the machine is pulled into the coal face as the augers turn. To allow room along the rib for the helper to work, on the sump cut the machine is not aligned perfectly and the rib is consequently not smooth, but consists of a series of angular offsets, each marking a cut.

Once the machine is sumped to the depth of the augers, both augers are raised to the roof to cut a vertical rib with no overhang. The right hand auger is then kept at the roof while the left auger is lowered to the floor for the right-traverse cut. Following the sump cut the jack pipes and ropes are moved to the right rib so that both ropes are utilized in dragging the machine across the face. The ropes are threaded through sheaves, one being effective on the front end of the machine body and one on the rear so that by means of the hydraulically controlled frictions the unit can be maintained in a position perpendicular to the face in mining



The Wilcox Miner. Two of these machines, based on the shortwall principal, have operated successfully at the C. H. Mead Mine No. 3

across the face. Immediately upon positioning the ropes the right-traverse cut is begun and the helpers move the steel safety jacks to clear a path for the machine. These steel safety jacks are passed across the unit, reset behind the advancing machine and provide adequate roof support in the immediate face region, being followed by wooden post timbering as the place is advanced. As the machine moves across the face the helper on the side toward which it is advancing must keep all loose coal cleaned up to allow a smooth bottom for it to slide on so that the cutting of uneven bottoms is avoided. The helper on the mined side shovels any loose coal spillage in a windrow against the face so that it can be picked up and loaded on the return traverse.

Following the completion of the right traverse cut the right or upper auger is dropped to the floor thereby mining a vertical right rib. The machine is then sumped into the face and the left traverse cut is begun by reversing the sequence of operations.

The face cycle just described is continued without interruption and with a surprising continuity of flow of coal when a crew is properly trained and little lost motion developed in the cycle. Following each 12 ft of advance the room chain conveyor is extended another 12 ft which is actually the only delay involved in the cycle and which can be accomplished rather quickly since the pan sections are placed handy by a supply man. Often if delays are encountered in the main haulage system the crew takes advantage of that delay to make conveyor extensions in order to minimize lost productive time.

Crosscuts are simply driven by maneuvering the machine perpendicular to the rib and mining in a similar way to face mining. The flexibility afforded by the double-jointed conveyor section allows this maneuver without difficulty.

Mining System

Presently at C. H. Mead Mine No. 3, two Wilcox miners are developing a new panel from which a 30-in. panel conveyor belt handles the coal to the track haulage sysem; however it is projected to utilize four Wilcox Miners in this panel. By means of cross conveyors and room conveyors all four machines will discharge onto the panel belt. The panel crew, when the projected plan is fully expanded, will consist of 12 face men, three on each machine, two supply men who will also rockdust by hand, one belt head operator and a foreman, a total of 16 men.

After panel entries are developed to their extremity two machines are projected to work rooms on each side of the panel on a retreat system, there being little difference anticipated in production in rooms compared to entry development.

The machine has proven itself as quite adaptable to the conditions at C. H. Mead and the company is highly enthusiastic about its potential effect in increased production per man-shift and cost reduction. The initial work with the machine was not properly set up to provide continuity of operation since loading from the chain conveyor directly into pit cars caused considerable delay due to trip changes, but even with that system production shifts of 100 tons per unit were accomplished. Now that the two machines have been installed and are loading onto a panel belt some of the haulage delays have been eliminated but the system has very recently been installed and proper trip changeouts are not fully accomp- unit is a shortwall cutting machine, familiar to most mine mechanics, it is readily repaired.

Maintenance

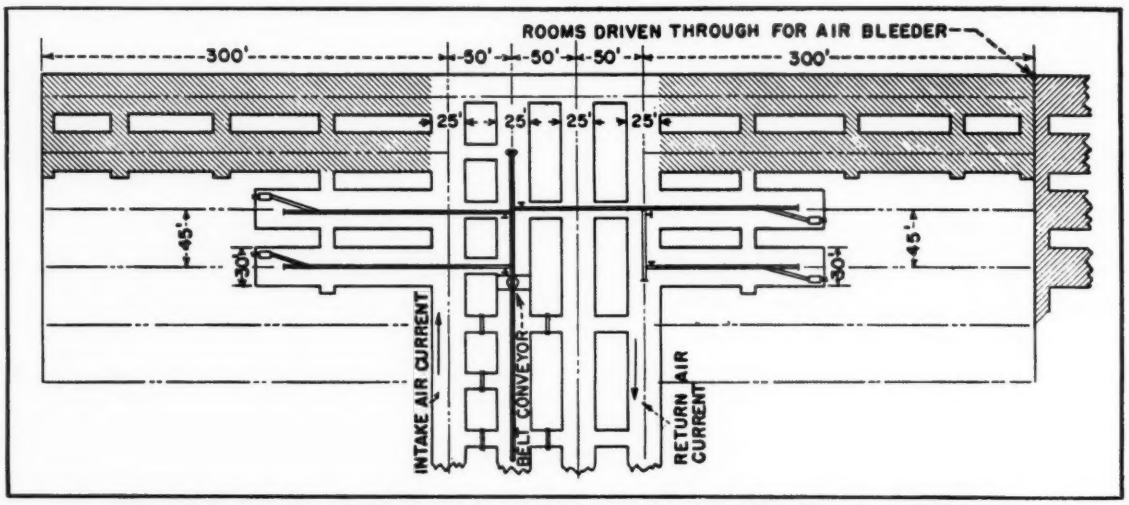
Little training is required to properly familiarize mine mechanics and operators with this machine since any cutting machine man can quickly learn its operation. The mechanical additions to the cutting machine proper are simple and easy-to-get-to so that mechanics readily become familiar with its maintenance.

This machine is still in its infancy, it is true, since only one is in production other than the two at Mead, that unit being operated in the Miller "D" seam of coal in the Central Pennsylvania field. Exemplifying the satisfaction already shown by those operating the machine, the C. H. Mead Coal Co. presently has another on order and the Pennsylvania operator while only having a few weeks' experience with their first machine, ordered a second.

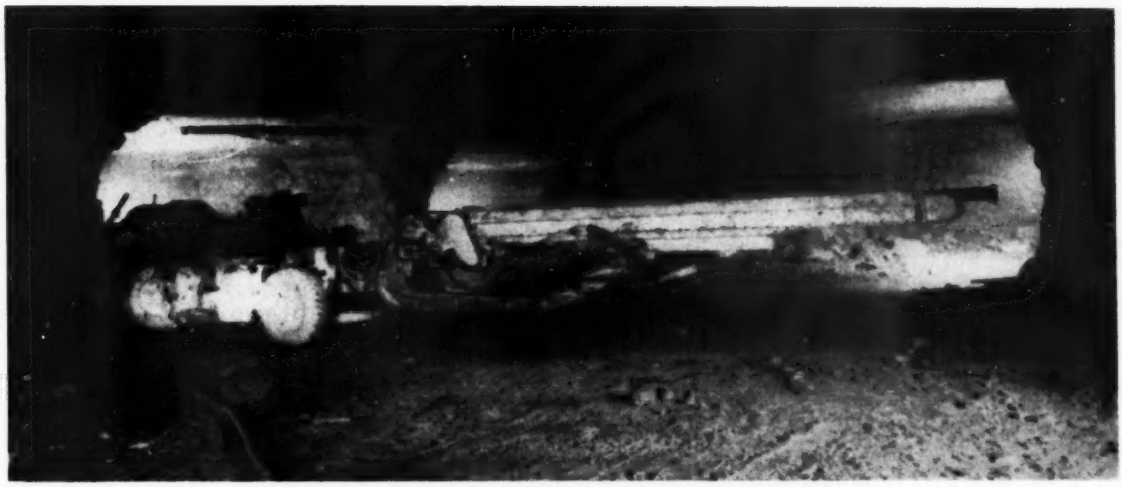
lished. The company has, however, with the new set-up had production shifts of 150 tons per machine and when all construction work is complete expects to average that or more.

New Design

Many improvements have been made in the machine since the first unit was put in service several months ago. There still remains a problem of improving the pick-up of coal by the conveying system and avoiding the spillage of loose coal behind the cutting augers. The Wilcox Manufacturing Co. has presently worked out a new and improved design which is fully expected to minimize this problem with a resulting improved tonnage from the machine. Mechanical trouble can be said to be practically non-existent on the present model and since the heart of the



Operation plan of the C. H. Mead Coal Co., which plans to place four Wilcox Miners in its No. 3 mine



The rotary drill has been successfully applied to production drilling

Rotary Drilling Development At White Pine

Where applicable, rotary drilling underground is becoming increasingly popular. This is the story of the White Pine mining department's experimental work with rotary drilling and its attempt to develop one rotary drill jumbo capable of performing the work of two standard percussion drill jumbos

By RICHARD F. MOE

Superintendent
White Pine Copper Co.

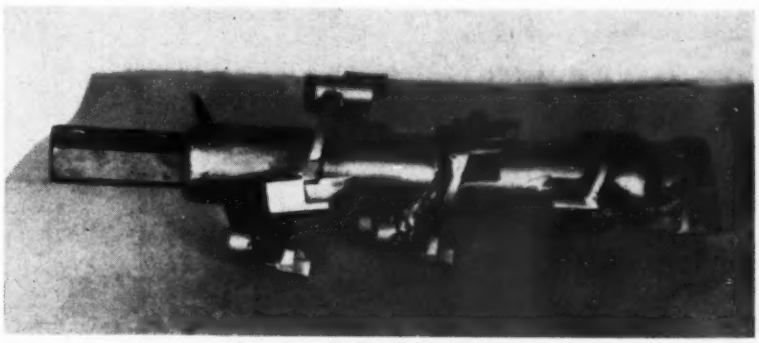
DURING the engineering and design phases of the White Pine Mine in 1952, experimental work on some phases of the mining problems was under way in the pilot mine. One project during this period was the testing of available rotary drilling equipment to establish the status in relationship to percussion drilling. The information obtained definitely indicated that the present work would require percussion drills. However, it also indicated that rotary drilling of the White Pine orebody should be given high priority in future experimental and research work.

Orebody

The White Pine orebody contains distinct lithologic characteristics which to a varying degree, affect drilling of the orebody. The parting shale, which is the orebody proper, is bedded between sandstone horizons. Generally, the sandstone is rather coarse, hard, abrasive and very often contains cobble and pebble beds close to the parting shale contacts. Tests have shown that the sandstones (wet) have a compressive strength of 17,800 psi.

The parting shale, averaging eight ft in thickness, may be divided into three distinct units which are from bottom to top as follows: (1) a thinly laminated shaley zone 1.5 to 1.8 ft thick, which contains fine sand content at the base and gets progressively less sandy towards the top; (2) the massive silt zone 2½ to 3 ft thick, which is uniformly dense and generally harder than other zones above or below; (3) the shaley laminated silt zone, three to four ft thick, of which the silty portion is slightly softer than the massive silt zone below, grading upward into a fine silt with occasional shale laminae one-half to one in. apart. The compressive strength of the parting shale (wet) averages approximately 20,800 psi.

If the hardness of the drilling hori-



A cone or Christmas tree type bit

zon were to be the gauge, the range could be said to vary between four and five.

Eight-In. Rotary Auger Drill

During the development stages, the main entry work at White Pine was confined to three drifts 8 ft by 24 ft in dimension. Vee cuts and numerous burnt cuts were tried in this width face but all failed to pull more than 8 to 8½ ft. The character of the ground was such that Vee cuts could not be opened sufficiently to pull and the burnt cuts froze or recompacted in the hole. In view of this, a rotary auger was used to drill an eight-in. hole approximately 13½ ft deep which served as the cut. Percussion drills then drilled the regular round pattern and produced excellent advance. Footage per blast increased to an average of 12 to 12½ ft.

The eight-in rotary auger machine is powered by two 15 hp air motors on rotation and one 7½ hp air motor on the feed. The thrust developed by the machine is 4000 lb and the rotation is 60 rpm.

Mobility and rapid set-up were prerequisites for the use of the auger in the multiple heading advance. To meet this condition, the drill was mounted in a spare shuttle car and attached in such a manner that forward or reverse travel of the conveyor flights in the shuttle car bed raised or lowered the drill as required.

The average penetration rate of the machine is approximately six in. per min in shale and from three to four in. per min in sandstone. In actual practice set-up and drill time amounted to 60 min.

The machine uses a wet flighted auger and a cone or Christmas tree type bit. The cutting and chipping bits required sharpening after 60 ft of drilling.

Since normal production faces are 32 ft wide, a Vee cut round is used that produces 11 ft of advance. The rotary auger drill has been relegated to development work in drifts less than 28 ft wide.

Small Hole Rotary Drilling

The successful applicaion of the eight-in. auger was an inducement to enter the field of small hole rotary drilling. Initial test work has been accomplished with the Joy Manufacturing Company's HPD-1 electric hydraulic prototype drill and a Chicago Pneumatic 555 air operated drill.

The Joy HPD-1 is powered by one 25 hp motor for the tram plus drill rotation and one 15 hp motor for other drill operations and drill feed. The thrust can be varied from 0 to 9000 lb. The rotation and torque are varied by a high-low gear. Rotation and torque in the high gear are 600 rpm and 140 ft lb, respectively. The low range produces a rotation of 300 rpm and a torque of 280 ft lb. In the present work flow control valves have been installed so that variable thrust and rotation combinations can be rapidly obtained. The torque characteristics remain constant dependent upon the high-low gear position. The machine can drill an 11-ft 6-in. deep hole at one pass at a feed rate of 0.22 in. per rev. Two sizes of drill rods, 1⅛ and 1 5/16 in. have been used. The drill rod life has been exceptionally good. More than 400 holes have been drilled with one rod.

The Chicago Pneumatic air operated 555 rotary drill was mounted on a seven-ft sash and placed on a standard jumbo for test purposes. The feed for the drill was the same as on a chain feed drifter machine. The feed pressure or thrust was held constant in a range of 5500 to 6500 lb. Rotation of the drill was altered by the installation of selective gearing. The rotation range was variable from 280 rpm to 600 rpm.

It is sufficient to say that the rotary drills mentioned above are capable of performing production drilling.

During the test work so far accomplished, several important principles have become apparent, particularly so when working in the high thrust ranges of 7000 to 8000 lbs. These are the principles of rigidity and counter thrust of the drill machine during the drilling operation. This principle comes into play more severely as the bit thrust is increased. There is a tendency of the drills to oscillate with rotation plus a counter action along the axis of the drill rod which allows longitudinal movement of the drill proper. It therefore follows that the drill machine needs to be adequately anchored and be capable of exerting a greater force than that exerted by the bit.

The experience gained so far has been sufficient for plans to be formulated as to the type of rotary jumbo most satisfactory for horizontal drilling of the White Pine orebody. Essentially such a jumbo would be rubber-tired, electro hydraulically operated, have two drill booms, each capable of drilling 14-ft deep holes across a 32-ft wide by 10-ft high face. Adequate anchorage and counter thrust should be built into the machine. The rota-

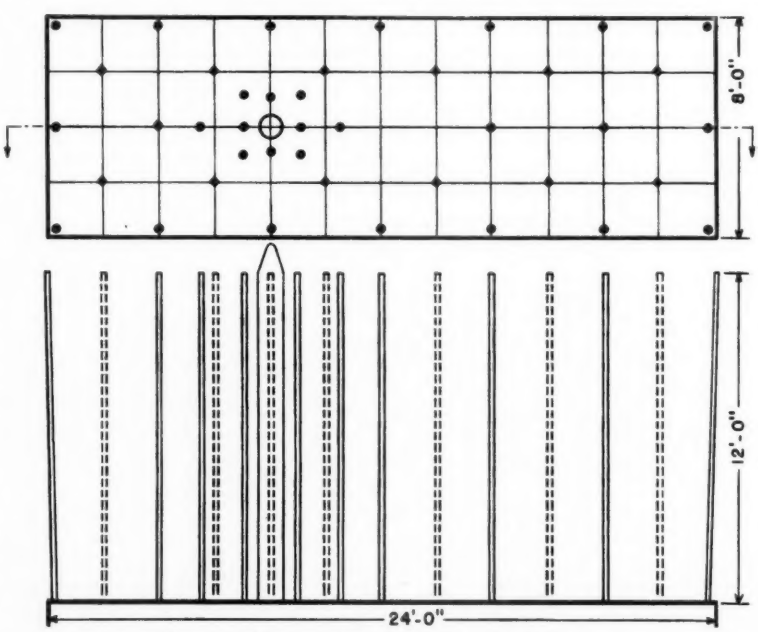


Diagram shows the drill pattern used at White Pine

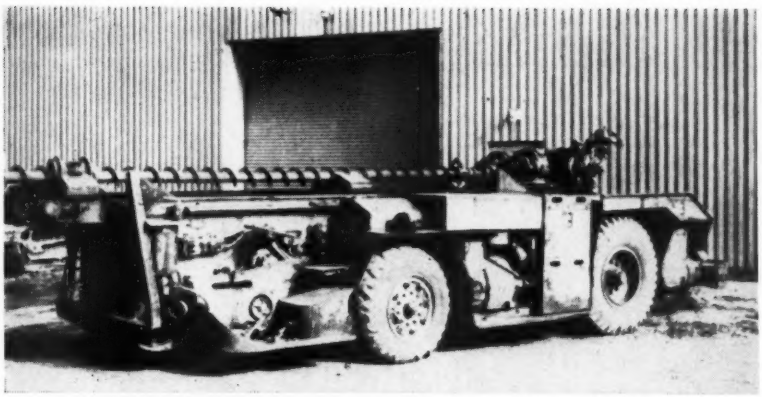
About the Author

Richard F. Moe graduated from the Colorado School of Mines, Golden, Colo., with a degree of Engineer of Mines.

After serving with the armed forces during World War II, he was employed by the American Smelting & Refining Co. in Mexico where he held the position of mine engineer and later mine superintendent.

Upon his return to the States, Moe was employed as mine superintendent with the St. Louis Smelting and Refining Division of National Lead Co. In this position, and later as general superintendent, he assisted in plant modernization and utilization of mechanical mining principles.

At present Moe is employed as mine superintendent with the White Pine Copper Co. He has had the heavy responsibility of getting the new mine into production at the White Pine project. His experience in equipping this mine for mechanized operation makes Moe eminently qualified in his subject.



Since mobility and rapid set-up were pre-requisite for the use of the eight-in. rotary auger machine in the multiple heading advance, the drill was mounted in a shuttle car and attached in such a manner that forward or reverse travel of the conveyor flights in the shuttle car bed raised or lowered the drill as required

tion, thrust and torque ranges to be varied by flow control valves to provide desired settings.

An experimental drill which showed promise of meeting these requirements was put into the mine about the end of October 1955. Should the experimental drill application be a success, further work in the development of a prototype two boom rotary jumbo will be forthcoming.

Rotary Bits

Bit life during the test work has been erratic and unpredictable. Generally the drilling has been accomplished with the spade bit, two pronged bit and three pronged drag bit. The size of the bits has varied from 1⅜ to 1¾-in. Past work has been confined to the 1¾-in. size bit. Present work is under way using a 1⅝-in. spade and two prong bit.

The maximum footage obtained from any particular 1¾-in. bit is 1899 ft after ten sharpenings. It has been found that excessive thrust of 7000 to 8000 lb with any rotation will bring about destruction of the present bits quite rapidly. The range where breakage can be controlled is below 6000 lb thrust and 300 rpm. A study of the drilling data shows that maximum bit life and penetration is obtained in the range of 4000 to 6000-lb thrust with rotation set at 250 rpm. In a check series using a group of 1¾-in. two pronged bits a life of 520 ft per bit was obtained using the above settings. In this range, drilling produces an average penetration rate of 5.5 fpm in shale and four fpm in sandstone. As a comparative figure percussion drilling averages 2½ fpm in the shale and sandstone.

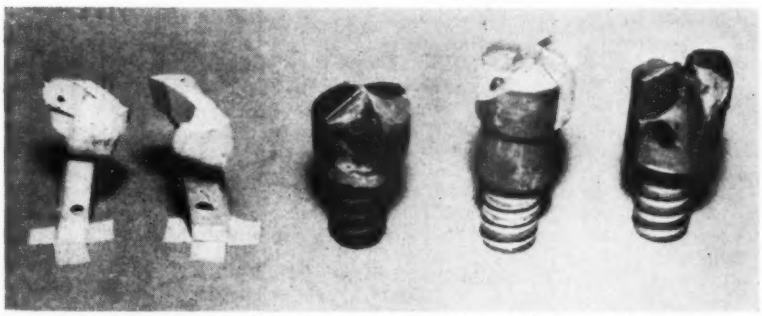
Penetration rates were seriously reduced when the outer bit corners showed a wear of 1/64 in. A 1/32 in. wear on the corners reduced penetration from 5.5 fpm to 4.0 fpm. In the shale horizon approximately 200 ft can be drilled before it is necessary to sharpen a bit. In sandstone, sharpening is required after 30 to 40 ft.

A majority of the failures have occurred through crushing, chipping and parting of the tungsten carbide insert. In an effort to correct this condition, the leading edge of the bits were given a negative rake. The negative rake did not improve the breakage problem and reduced the penetration rate or cutting ability of the bits.

The concept of low rpm and high thrust for best bit life holds true within the orebody. However, a variation of the fact that high rpm and high thrust produce maximum penetration has been experienced. Graphed performance charts of high rpm and thrust have not always indicated the best penetration rates. In a number of cases moderate thrust and high rpm have given better penetration. The present drilling program now in progress will finalize thinking regarding this principle.

In conclusion, it is evident that further improvement in rotary drilling is in the hands of the bit manufacturers. Drills available will out-perform the present bits. This does not preclude the fact that improvement of the rotary drill machines would help to prolong bit life. The elimination of drill oscillation, greater drill stability and improvement of the hydraulic systems to provide smoother operation would be advantageous.

The object of the White Pine Mining Department experimental work is the development of one rotary drill jumbo capable of performing the work of two standard percussion drill jumbos. The economies to be realized by the reduction in equipment, production and maintenance costs have proven the time spent to incorporate rotary drilling into the mining cycle a worthwhile project.



Bit life during the test work has been erratic and unpredictable, but the concept of low rpm and high thrust for best bit life has held true within the ore body



Uranium prospectors never die. . . .

Truck Haulage With Large and Small Units

Two well-qualified men consider the aspects of truck haulage at coal strip mines. One author, using cost figures, compares small units with large ones, and comments on some of the more important factors that affect haulage. The other writer emphasizes the part maintenance plays, using his own mine as an illustration

By W. C. SPENCER
Assistant Chief Engineer
The Pittsburg & Midway Coal Mining Co.

THIS subject of truck haulage and "what is the proper size truck?" has been discussed many times before; however, it is a very interesting subject because there are so many different conditions that affect the final cost. One of the primary conditions controlling the final cost is the weather; or, more specifically, the amount of moisture. The type of pit floor and the kind of road material that is available at a reasonable cost govern how good the roads are. Maximum grades and length of haul are conditions that companies try to keep to a minimum but actually do not have too much control over.

It is said that adequate material and design are not available to give good balance in the larger haulage units. In other words, we now have engines that can pull larger units but the transmission or some other part might not be able to carry its load. The relatively recent development of torque converters and other fluid couplings that give a smoother flow of power have helped to eliminate some of the trouble spots.

Operating Costs

An examination of some cost figures from records kept for two years on seven 40-ton coal haulage units illustrates some of the points mentioned so far. Six of these units have conventional transmissions and one has a torque converter. The cost of operating supplies for the truck with the torque converter was almost 40 percent higher than for the conventional trucks. Most of this is due to a much higher fuel consumption because the torque converter permits the engine to operate at full rpm all the time that there is a call for power. It is hard to arrive at a fair comparison for the truck with the torque converter is a much newer unit; however, it more than made up for the extra fuel cost in lower maintenance cost. The total operating and maintenance cost for the two-year period showed a saving of $3990 for the torque converter unit over the average of the other units. In addition to lower cost, the torque converter truck can pull larger loads with greater speed on bad roads and steep grades. This means bigger tonnage on days that the roads are bad and the coal is slow moving from the pit.

After looking over our own haulage cost records and comparing the cost for 20-ton units with 40-ton units at two mines in Kansas and Missouri, I

(Continued on page 72)



The most important thing to remember when considering haulage units is that they are only one link in the chain of production. Since it is difficult to prove that any one size unit can be operated for less money than the others, it is better to determine what part of production one truck should be responsible for



Truck and road maintenance is very vital to constant high production at any time

Haulage Equipment and Maintenance

By FRED BRAMER
Equipment Superintendent,
Enos Coal Mining Co.

HAULAGE equipment now being used at The Enos Coal Mining Co. in southwestern Indiana consists of ten Dart trucks with 53 cu yd water level bottom dump coal hopper trailers and six Mack trucks with 44 cu yd Austin-Western dump coal trailers.

The Dart trucks, Model 145 SBDT, are equipped as follows:

- NHRBS-600—300 hp Cummins diesel engines
- Allison TC 654 Torqmatic Converters
- Allison TC-602 Torqmatic Transmissions
- Dart D75—Triple reduction 85,000-lb capacity rear axle with final gear reduction 12.57 to 1
- Dart Timken FU-900—25,000-lb capacity front axle and hydraulic steering
- 1400 x 24—20-ply front tires
- 1800 x 25—24-ply tires on driving and trailer axles
- Wheels, rims, hub brake and wheel bearings are the same on driving and trailer axle

The Mack Model No. L. R. are equipped as follows:

- NHRBS 600—300 hp Cummins diesel engines
- Mack TRDX51—eight-speed duplex transmissions
- Mack CL505—14½-in. two-plate clutches
- Mack 60,000-lb capacity single reduction rear axle with final drive gear reduction of 4.78 to 1
- Power steering
- 1400 x 24—20-ply front tires
- 1600 x 24—24-ply tires on driving trailer axles.
- The wheel hub, wheel bearing and brake are not interchangeable from tractor to trailer.

Both the Darts and Macks are equipped with air cylinders to open and close the bottom dump clam shell door of the coal hopper trailers.

History of Mack Trucks

Six Macks were put in service in the summer of 1949. These were originally equipped with NH-600, 200 hp Cummins diesel engines. In 1951 these engines were removed and replaced with 300 hp Cummins NHRBS 600's. It was felt that the Mack units were under-powered and the company had use for the 200-hp engines in its draglines.

These trucks have about 4500 hr on the 300-hp engines. Two of these engines have new bearings, liner seal, rings and valves ground. The company is changing to PT pumps on all engines. The miles per gallon averaged 2.33 for the year 1955.

The transmissions have been overhauled several times, but only four of the differentials have been overhauled. The 51, 1600 x 24, 20-ply tires have gone 1,964,276 miles, or an average of 38,515. These tires were all rayon.

History of Dart Trucks

The Dart Trucks have also given good service. Six Dart Coal Haulers were put in service in November 1950, two in October 1951 and two in August 1954.

The first eight trucks have an average of over 100,000 miles per unit to date. The Cummins engines in the eight Darts have had an average of 91,107 miles or 7288 hr before major overhaul, and to date only four of these engines have been overhauled. The four engines are still in use and the company intends to remove them for major overhaul in the very near future, as soon as time permits. In the early life of these engines in both the Macks and Darts, Cummins campaigned the engines and changed out the piston due to some trouble that Cummins found with the sneezers in the old type piston. New pistons, pins and rings were installed, and three of these engines had valve jobs done on them at that time due to the sneezer coming loose in the piston, causing valve failure. All the other engines have

never been touched, except for head gasket failure and minor adjustments. The average miles per gallon of fuel for 1955 was 1.81.

One torque converter was lost recently due to pilot bearing failure. The first six units were delivered in November 1950. The Allison Torque Converter Co. made a campaign on all six converters due to some changes Allison made in the pilot bearing and seals. This work was done by Allison service men on a "No Charge" basis to The Enos Coal Mining Co. To date three transmissions have been out for overhaul at a parts cost of $395. Two of these were campaigned by the Allison Co. at "No Charge" to the company. Five transmissions are still running, and have never had any mechanical work done to them except regular adjustment and lubrication change.

All tires are checked for air pressure and stones removed by third shift men. The 83, 1800 x 24, 24-ply tires have 3,912,050 miles, or an average of 47,133 miles per tire. These tires were all rayon. The company feels that by changing to 1800 x 25 all nylon, it will increase its tire mileage.

Maintenance Program

The Enos Coal Mining Co. contributes the long life of its engines, torque converters and torqmatic transmission to its maintenance program. Drivers are all instructed to bring equipment to the shop anytime anything is not in proper running order. Night maintenance men check the equipment each night for loose wheel lugs, tire pressure, water and air line hose and belts. They also check for oil leaks and check all oil and air filters. The company has concrete floors in its service shop, where all the work is done, and dirt and dust is kept to a minimum.

There are three men on day maintenance and four men on the second shift, with two men on third shift.

Two water wagons spray the roads all the time, except when the roads are kept wet by regular rainfall. Dust is the biggest cause for engine, torque converter and torqmatic transmission trouble. If air cleaners are properly maintained and roads well watered, repair bills will be greatly reduced.

All of the roads are built out of gob, with a top coating of crushed stone. The road building and maintenance cost is very low and the method makes a very good road, but requires constant work with maintenance and water wagons.

The company's parts inventory on Dart trucks is $7,632.10, and on Mack truck, $5,009.85.

Truck Haulage with Large and Small Units

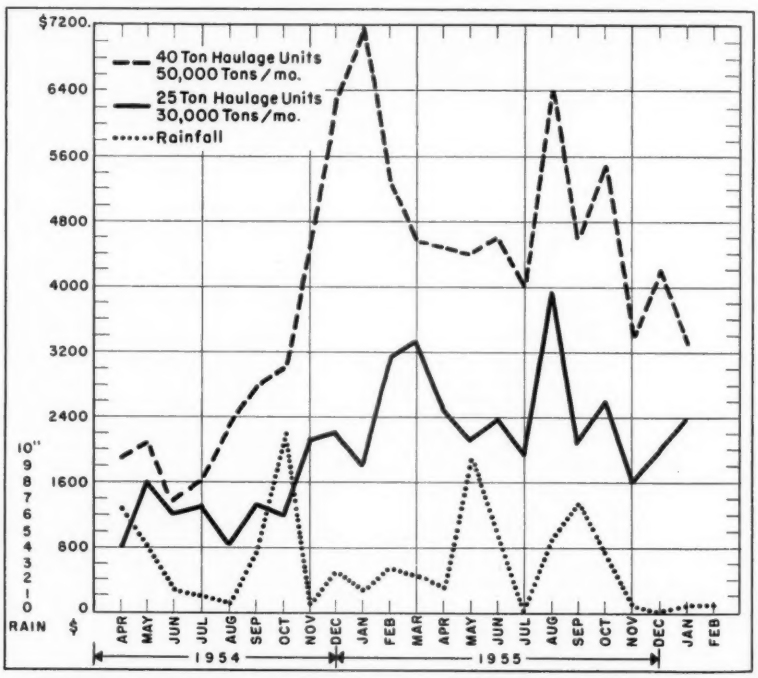
(Continued from page 70)

found that the actual operating cost remained fairly constant but that the maintenance cost varied quite a bit. Plotting the maintenance supply cost for the two mines on the same graph showed that they followed a very similar pattern. Since the two mines have similar conditions and are less than 100 miles apart, it was apparent that the weather must have some affect on the maintenance cost. After plotting the monthly rainfall on the same graph, the reason for the extremely high cost during certain months was clear. During October 1954, we had ten in. of rainfall and following this, the truck maintenance supply cost jumped to 180 percent of the average cost on the 40-ton units and to 163 percent of the average cost on the 20-ton units. This comparison of only two mines does not mean that the 20-ton units require less maintenance, but only that the weather has a great effect on any size truck operating off the highway. During one five-month dry period, the maintenance supply cost was 67 percent below the average cost. There was some lag in the cost rise after an extremely wet month, which is partly due to the time that it takes for the damaged parts to fail and partly to the time that it takes to replace and pay for parts taken from the stockroom.

First Costs

After reviewing some up-to-date haulage truck prices and specifications, I found that the price per ton of haulage capacity does not change much in the 25 to 50-ton class. The price figures from one truck company showed that for the same carrying capacity, it is cheaper to buy 50-ton units than 25-ton units. Part of this is brought about because in the larger units the pay load represents a greater percent of the gross load. Since the dead load does not go up in direct proportion to the pay load, the horsepower requirements can remain the same per ton of gross load and yet the gross load will not have to be doubled as the pay load is doubled.

The most important thing to remember when considering haulage units is that they are only one link in the chain of production. Since it is difficult to prove that any one size unit can be operated for less money than the others, it is most important to determine what percent of the production one truck should be responsible for.



Maintenance supply costs vs. rainfall for 40 and 25-ton capacity haulage units



A shortage of miners, aggravated by antiquated equipment, plagues the German coal industry

Europe Needs More U. S. Coal

An on-the-scene report of the great coal shortage in Europe with particular attention to West Germany

THE six member nations making up the European Coal and Steel Community are increasing the coal and steel pool's total coal imports from 22.9 million tons* in 1955 to 31.4 million tons for 1956.

Coal-short West Germany will take 41 percent of the pool's total imports of coal. The United States, as was the case in 1955, will again furnish most of the pool's imported coal. Of the 31.4 million tons being imported by Ecosc this year, the U.S. will supply 25.7 million tons, compared with 15.9 million tons last year. England's contribution to the import total will be negligible—around two million tons, according to figures of the Ecosc import planning board.

Ecosc has supplied the following table on the coal and steel pool's coal imports last year and imports projected for 1956:

(In millions of tons)	1955 Total imports	1955 From U.S.	1956 Total Imports	1956 From U.S.
W. Germany	9.3	7.0	13.0	11.5
France	2.9	0.8	6.4	4.6
Belgium	1.4	0.8	2.0	1.6
Holland	2.6	1.6	4.0	3.2
Luxembourg	—	—	—	—
Italy	6.8	5.7	6.0	4.8
Totals	23.0	15.9	31.4	25.7

Coal consumption in the Ecosc is climbing steadily, gaining 1.8 percent in the first quarter of 1956 and rising nearly three percent in the second quarter. Consumption in the first quarter totaled 84.8 million tons of coal as against 83.3 million tons in the first quarter of 1955. A slight drop in consumption occurred in Italy, Holland and France. But this drop-off was overbalanced by increased consumption in West Germany (total consumption 45.17 million tons), Bel-

* Throughout this article tons refer to metric tons of 2204.6 lb.



Apprentice miners at a training school in Essen. When 18 they can become journeymen miners and at 21 they can qualify as "hewers," the top miner grade

gium (10.38 million tons) and the Saar (where consumption increased 1.4 percent).

Need More Coal in Future

Ecosc's planning board foresees a continued steady rise in the pool's coal requirements well into 1957. For example, the pool is using 2.5 million tons more coal in the third quarter of 1956 than it did in the second quarter. Coal imports ordered from the United States for 1956's third quarter amounted to 7.5 million tons. Tentative 1957 Ecosc import schedules call for aronnd 39.5 million tons, of which the United States would furnish 34.2 million tons. These are not hard estimates, however, and some Ecosc planners feel they may have to be revised upwards.

Ecosc coal import statistics clearly reflect the coal crisis confronting the pool's booming steel industry. No relief is in sight; on the contrary, the pool is reconciled to hiking coal imports indefinitely until nuclear energy can be utilized.

How Big is the Shortage?

West Germany is hardest hit by the coal shortage. However, the German situation reflects, in exaggerated degree, the situation prevailing in all of the other Ecosc nations, Luxembourg excepted. The Federal Republic's workable reserves of coal are estimated at 65,000 million tons in depths to 4000 ft. How much of this can in fact be mined economically will depend on the progress of mining techniques, and on experts' future views regarding the maximum depth at which exploitation of seams with strong overlying rock strata will be a paying proposition. By present mining standards, "economic coal reserves" are believed to be about 48,-500 million tons.

For the revival of Germany's economy, her rich deposits of highgrade coal have been of immeasurable value. From the original reserves of the Ruhr coal fields alone about 6200 million tons have been mined since 1792. By far the largest part of this amount, more than 5000 million tons, has been produced and consumed in the current century. In the period from 1921 to 1930 about 1000 million tons were mined in the Ruhr basin and about 1050 million between 1931 and 1940. Production dropped to 497 million tons in the three-year period of 1941 to 1944 and to 890 million tons in the nine-year period of 1945 to 1954.

The coal reserves are of great significance for a country whose alternative resources in primary energy, oil in particular, are relatively small. Even assuming that some new discoveries of oil and natural gas will be made, Germany's coal reserves will undoubtedly remain her foremost source of primary energy. At present levels, the country's known oil deposits would be exhausted in ten years if domestic production alone had to meet the demand for crude oil in present-day German refineries. Existing reserves of lignite, in terms of calorific value, are equivalent to approximately one-third of the bituminous coal reserves.

As much as 90 percent of total energy consumption in the Federal Republic is still being supplied by lignite and bituminous, the latter accounting for almost 75 percent.

Little Raw Coal Used

The major part of bituminous coal output is no longer consumed directly as coal but in some form which has been processed from this mineral. As much as 57 percent of the coal mined in Germany is turned into coke, briquettes, gas, power, benzene or coal-tar constituents. A comparison of present coal consumption with that of 1936 shows that only the consumption of secondary fuels and power has gone up, while consumption of raw coal shows a slight decline.

The amount of raw coal in total consumption decreased by almost nine percent, whereas processed fuels and power made considerable gains, as follows:

Coal Use	Gain Over 1936
Coke	25 percent
Gas	27 percent
Liquid Fuels	57 percent
Electricty	181 percent

By itself promoting the supply of gas and electricity, the coal industry has greatly encouraged the shift to these forms of energy, and by thus adjusting to the trends of energy requirements the industry has succeeded in maintaining the importance of coal in the total energy supply.

Of about 120 million tons of coal available for inland consumption in 1954, as much as 77 percent was processed or converted into secondary fuels before being put on the market. Ninety percent of West Germany's power generation depends on coal. Individual power plants report that the German coal industry, in most cases, is supplying only 60 percent of their needs.

West German mines produced 66,-800,000 tons of coal in 1955-56, a



American coal, here being unloaded from barges at the Rhine port of Duisberg, is playing an increasingly important part in European economy

scant increase from the 63,400,000 tons the Germans mined in 1954 - 55.

What Has Happened?

What has happened to the German coal industry? Basically the same thing that plagues the British coal industry—the shortage of miners aggravated by antiquated equipment.

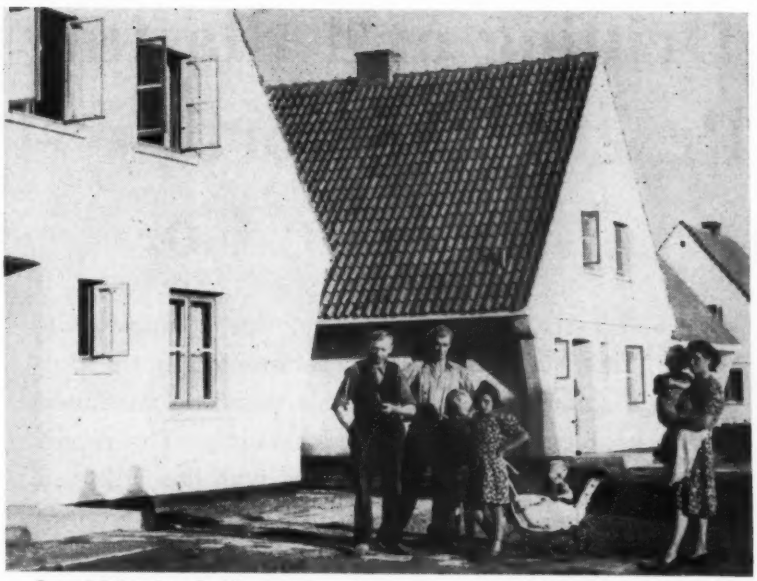
Since 1946 more than 300,000 miners have walked out of the pits—never to return. Ten out of every 100 miners have thrown over their jobs in the last six months. "Why mine coal?" asks Hermann Schmidt, 28, who quit his miner's job "forever." "I can make more money at an easier and safe job in industry." Hermann, unfortunately for Germany, is telling the truth. Ruhr coal mines are being boycotted by youth. The Ruhr needs 45,000 apprentice miners. It can get only 27,000. Today, the Ruhr miner force is over-age, most of the miners being over 45. In the past, the mining industry tried to recruit its miner force so that the bulk of miners would be in the 30 to 45 age bracket, rounding out the force with apprentice miners in their twenties and veterans over 45. Today, it is impossible to maintain balanced pit forces. Mines are forced to take anybody they can get—and rejoice. Further, once a miner is recruited, there is no assurance he can be kept on the job. Miner employment is on a virtual day-to-day basis. The German coal industry, to illustrate, claims that Ruhr concerns have lost 150,000,000 marks (approximately $35,700,000) in the last three years through broken miner contracts.

Since 1919 much has changed in the Ruhr mines. Then the average miner dug six wagons of coal per shift; today he fills 20 wagons. Then he was paid 5.60 marks ($1.33 at today's exchange rates) a shift; today 18.17 (approximately $4.33). Even when it is taken into account that in those distant days the miner paid much less in the way of living costs, today he is incomparably better off.

Today, the miner is the most favored of German labor. He is the subject of scientific studies by government and industry, all having the aim of devising new and more elaborate means of coaxing youth into the pits. Right now the joint efforts of government and industry are centered in mine modernization and increasing safety.

Germany has experienced a series of mine disasters in recent years. Statistics show the incredible number of one million mine accidents from 1947 to 1954. These accidents killed 4984 miners, injured 73,141 seriously and 181,352 less seriously. A total of 797,901 miners received minor injuries.

But the mine owners also have complaints. Their overriding complaint is simply that coal mining has become an unprofitable industry. German mine owners say they are being squeezed out of existence between government-set ceilings on coal prices and the union's wage demands.



A model housing development for miners was constructed near Dortmund with American funds to help spur coal production

Not only is the mining industry squeezed by coal price ceilings and high wages; it is struggling simultaneously to modernize the pits. Little has been done since 1938 to replace and up-date worn-out mine equipment. It was not until 1952 that the industry came into a position to begin extensive overhaul and replacement of mine equipment. Then, as now, the industry was handicapped by a shortage of investment funds. And, to discourage the industry still further, there is not only the problem of worn-out equipment; there is also the equally troubling problem of worked-out mines.

All of this means the coal output per miner is dropping steadily. Today, the West German coal industry has 338,000 underground miners who produce an average of 1.48 tons of coal per shift. In 1952 the production per miner per shift was 1.52 tons, and prewar, 1.92 tons. The industry is doing what it can, with the funds at hand, to modernize equipment and rationalize the coal production process. It is pushing construction of miner housing and providing various other miner incentives. But basically the German coal industry is a sick industry, and, realistically, the industry is facing up to this fact.

Airleg for Long Hole Prospecting

(Continued from page 49)

Drilling Costs

Long-holing with the airleg drill has been in progress at Bunker Hill & Sullivan for the past 10 months. During this time, 10,321 ft of hole have been completed at a total direct cost of $1.31 per ft. Results appear to justify the cost.

The drill is considered a useful prospecting tool for the following reasons:

1. Possesses flexibility.
2. Machine is a light-weight drilling unit easily adapted to long-holing by one man.
3. Drilling unit is simple and long-hole technique can be taught to rock-drill operators.
4. Initial outlay for drilling equipment is comparatively small.
5. Rope-thread rods and rod couplings reduce steel breakage, and time consumed in removing rods from the hole.
6. Direct costs per ft are comparable or less than other types of non-coring drills.

DIRECT LONG-HOLE DRILLING COSTS

Supplies:	*Cost per ft*
Rods	$0.23
Couplers	0.08
Bits	0.16
Reconditioning rods	0.07
Total Supplies	$0.54
Labor:	0.77
Total direct cost per ft	$1.31

Drilling and Blasting Practice at Northwest Magnesite Co.

Needing more drilling capacity, this company decided, after considerable experimentation, to purchase a rotary drill. Use of this machine produced many problems in drilling and blasting. The report summarizes the mine's experience with the drill and describes the drilling and blasting practice that resulted

By J. R. BRAMMER
Mining Engineer
Northwest Magnesite Co.

THE drilling and blasting practice discussed in this article are those that have been used at the Red Marble Quarry of the Northwest Magnesite Co. This quarry lies about 14 miles southwest of Chewelah, Wash., between 3700 and 4100 ft of elevation. The magnesite body extends for a distance of 4000 ft along a ridge. The strike is roughly north and south with the dip from 40° to 60° to the west. The magnesite and dolomite beds are overlain by dirt and shale. In the top magnesite beds a general trend of higher silica rock has resulted in chert nodules and lenses.

The magnesite is handled with 2½-yd shovels loading into 15-ton diesel trucks. Fragmentation requirements allow 42-in. maximum size boulders, which will go through the shovel dippers and the primary crusher. The crushed rock is hauled by aerial tramline to the separation mill eight miles away.

Drilling equipment at the Red Marble originally was a spread of six 3½-in. drills on light wagon mounts. Holes were collared at three in. and finished at 2¼ in. In the first year of operation, these six drills averaged 88 ft per shift each or about 1700 tons per shift production. This would not be enough to produce both the magnesite rock and waste necessary to operate at normal production. It was plain that more drilling capacity was needed.

Drilling Experiments

Tests were made to determine if more rock could be broken by some other drilling method. Diamond drill holes on a 5½-ft grid were drilled on a bench to a depth up to 55 ft. Fragmentation was fair but the drilling cost was higher than wagon drilling. The skill required of the operators was greater than in running a wagon drill. In 1950 two shots were laid out using six-in. holes, drilled with a churn drill. The first was drilled with 13 ft of burden and 15-ft spacing. The powder factor was calculated at 1.05 lb per cu yd. Fragmentation was poor. The second using a 14 by 15 pattern was loaded with a powder factor of 0.75 lb per cu yd. Fragmentation was fair. Comparison of the 21.5 ft per shift drilled with churn drill rates against rotary drill rates in eastern dolomites showed that a rotary drill should solve our drilling capacity problem. Experimentation and experience should produce satisfactory fragmentation with 6¼-in. bore holes.

Rotary Drill

Northwest Magnesite Co. took delivery of a new rotary drill in January 1951. This drill is mounted on caterpillar tracks and driven by a 50 hp electric motor. Power is supplied through a trailing cable from a skid mounted transformer bank. The drill is handled by two men, an operator and assistant. The operator moves the drill, levels the drill with three hydraulic jacks, controls the drill bit pressure and rotation speed from inside the cab. The assistant directs the operator in moving over hole sites, connects the four-in. sq drill steel and shifts the automatic chuck to raise or lower the drill steel. Hydraulic pressure acting through two six-in. cylinders and the automatic chuck puts up to 22,000 lb on the three coned bit.



A view of the Joy 58-BH drill in operation at the Northwest Magnesite Company's property

Recently, two transformer banks were located permanently with 440 v power lines run to strategically located mounted switches to reach each operating pit.

The requirements in preparing drill sites for the rotary drill are very simple. On regular quarry floors, occasionally the drill sites must be graded with a bulldozer to remove large rocks or cut down humps. On original surface ground, drill area preparation must meet these requirements:

(1) Slope of the area sloped to less than 20 percent to allow the drill to move.

(2) Obstructions or irregularities of greater than one ft covered or removed.

(3) Access and drill lanes cleared to width of 14 ft or more.

The drill will travel slopes up to 20 percent under its own power. Occasionally in soft ground, it is necessary to help the drill with a bulldozer. The pontoons will clear about two ft above the ground and the width of the drill at the pontoons is 14 ft. As much as eight ft of loose fill, dirt, quarry rock or shale has been used to prepare drill sites. Little trouble is encountered in drilling through this loose fill if the drillers decrease the bit pressure to about 50-100 psi and run the rotation in low gear.

The drill is normally operated in third gear and at about 2000 lb bit pressure in collaring drill holes. After the bit is drilling solid rocks the drill pressure is increased to 20,000 lb and rotation is shifted to fourth gear. The 6¼-in. holes are drilled to a predetermined depth with five-ft over-drill.

Efficiency of Machine

The drill was used extensively during the first year in drilling through original surface ground. The operators were inexperienced and had not yet developed many of their present short cuts. During the first year the average drilling rate was 100.48 ft per operating shift. Net drilling time was 51.45 percent of attempted time. In the next three years, while the drilling rate varied from 105.60 ft per operating shift to 76.27 ft, the net drilling time increased from 76.76 percent to 80.30 percent of attempted time.

The steady increase in net drilling time reflects the supervision of the quarry foreman and the fine program of the maintenance repair foreman. It would appear that the efficiency of the machine has been lowered drastically, but this is not the case. Much of the earlier drilling was in surface ground. The large quantity of shale and dirt yielded higher drill rates. Practically all the drilling in 1954 was in solid rocks, hence the low average of 76.27 ft per shift.

Tons per ft of drill hole varies directly with the height of face. Using the present practice with the loading factor of one lb per cu yd, five-ft over-drill, 12 ft minimum stemming and powder load of 12 to 14 lb per ft of hole, a 45-ft hole on a 40-ft face produces about 450 cu yd or 10.0 cu yd per ft of hole while a 35-ft hole on a 30-ft face produces about 300 cu yd or 8.57 cu yd per ft of hole. Using the average obtained in 1954 of 76.27 ft per shift, one drill shift would prepare from 1600 to 1900 tons per operating shift.

Bit life for this drill has varied from the extreme of three ft to over 1100 ft, while the average in increments of 25 bits has varied from 222 ft to 536 ft with an over-all average of the 469 bits recorded, of 361 ft in rock. In addition, these 469 bits have drilled an average of 45 ft of dirt and 45 ft of greenstone and shale. But life in terms of tons drilled per bit averages about 7100 tons of rock and an additional 1700 tons of dirt and shale for a cost per ton of only 14 mills.

Blasting Problems

The first year of operating the rotary, blast hole drill produced problems in blasting as well as drilling. The experience of the blasting crew had developed from sprung, jackhammer holes to three-in. wagon drill holes. There were many questions to be answered. How much over-drill must be allowed? How close should hole spacing be to get good fragmentation at reasonable cost? Should the load be decked or columnar? How long a toe could be broken with five- or seven-ft over-drill? How many rows of holes would be possible? Reading blasting articles and reports, experimenting, and consulting with the technical representatives of the explosive manufacturers all aided to develop the Northwest Magnesite Company's present practice, with which it is quite well satisfied.

Before discussing the mine's present practice, it would be appropriate to review briefly some of the answers the company has found that apply to its operation at Northwest Magnesite. As a beginning, the company assumed a powder factor of 1.2 lb per cu yd, seven-ft over-drill and 15 ft of stemming. The area calculated for each hole on the then normal 40-ft face was 225 sq ft or 15 by 15 ft on a sq grid. This powder factor was found to be excessive and was gradually re-

About the Author



James R. Brammer received his training in mining engineering at the School of Mines of the State College of Washington He has been with Northwest Magnesite Co. since June 1950, and his present position is chief mining engineer of the company's Chewelah operation



Blaster loading holes with ammonium dynamite and nitro-carbo-nitrate explosives



Faces parallel to strike after blasting

duced to 1.0 lb per cu yd. The only way the seven-ft over-drill could be decreased was to drill the toe with wagon drills to prevent high bottom at the front of the shot. Multiple row shooting minimized the need of drilling the toe but did not eliminate it. One of the important advantages of the blast hole drill was lost if it was necessary to clean the toe, trim the face and then drill the toe between each blast. If the toe wasn't drilled, there was high bottom in front of the shot to be drilled. Blasting without relieving the toe was tried several times of necessity and was found to be quicker and often cheaper in initial cost, but it might be more expensive in the long run due to higher maintenance cost of shovels and trucks. Another method was tried in the attempt to whip the problem of long toe and high bottom. High density, high strength gelatin dynamite was used in the bottom load of the front row. The change did decrease the problem a little. The spacing of the holes was brought in as close as 12 ft sq with decked charges in the attempt to get maximum bottom shear and distribute explosive load. The only noticeable change was increased drilling cost and large boulders from between the explosive decks.

Both millisecond delay electric caps and primacord were used in these early shots. Fragmentation varied with each method, but a considerable savings was realized in loading cost when detonating with primacord. Primacord was used almost exclusively during 1952 and 1953. Many variations in spacing, burden, loads, explosives and delays were tested during this period.

Multiple row, instantaneous blastings offered low drilling cost, low labor cost clearing the face and drilling the toe, low labor cost in loading the holes. At the same time, fragmentation was not too good, and backbreak was excessive, which necessitated drilling the toe. Multiple row blasting with millisecond connectors improved the fragmentation and backbreak with very little increase in loading cost, but a new problem arose. The 17 millisecond delay between proved to be sufficient time for rock movement to cut the primacord in an adjacent hole. Cut-offs are both expensive and dangerous. Single-row, millisecond delay connection with primacord seems to be the best answer as the rock should move away from the face instead of parallel to the face. Two consecutive blasts produced cut-offs using this method.

East-West Drill Rows Tried

The next big change in blasting was orienting the drill rows at right angles to the strike of the rock. The usual development of the quarry pits is from the west with the pit faces roughly parallel to the strike of the deposit and the rock structure. The east-west rows eliminated back-break up the dip of rock, along weak partings in the bedding. This method gave good fragmentation, but at times, severe backbreak occurred in rock above the powder column. The spacing was varied to test shots with stemming from 12 to 20 ft. The back-break still started at the top of the powder column. Millisecond delay electric caps, with bottom priming decerased the backbreak except occasionally behind those holes with the least delay. The action behind those holes is probably similar to what occurs behind each hole of an instantaneous primacord shot.

The type of explosives used when the toe burden gave difficulty was gelatin dynamite in the bottom with less dense ammonia dynamite in the upper section of the column. Ammonia dynamite was used for the entire load when the rows were changed to east-west orientation. The company has also experimented considerably with the explosive, nitro-carbo nitrate. It has the advantages of less cost and quicker loading. It is not cap sensitive nor water-resistant.

Northwest Magnesite Co. is still testing all possibilities in drilling and blasting practice to further improve its operation. Improvements to date have virtually eliminated drilling toe and high bottom, excessive boulders in the muck pile and high slope minings. All new pits are being developed on east-west faces with 30-ft lifts so the shovels can scale down the face.

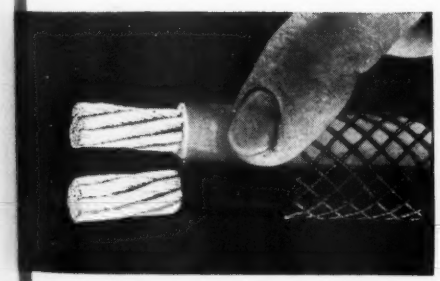


Face after shooting normal to the strike. This method yielded better results than shooting parallel to strike

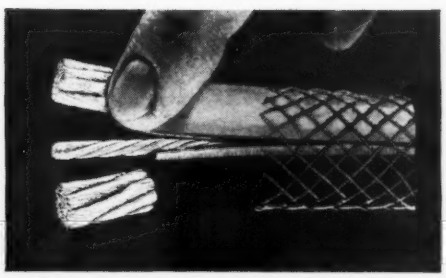


2-year study of shuttle car cable failures gave Anaconda engineers the information they needed to produce the new Securityflex cable.

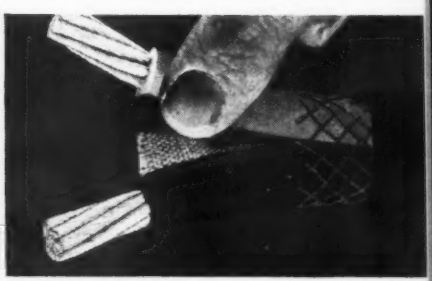
We engineered this cable "inside out"— to give you longer cable life



New Neoprene insulation compound gives Securityflex rugged *inner* strength.



New flat stranding of grounding conductor prevents broken wires and failures.



New nylon Anti-Short Breaker Strip* delivers amazing crush resistance.

Before designing the new Securityflex* cable, Anaconda engineers checked thousands of shuttle car cables of all makes to see why they failed.

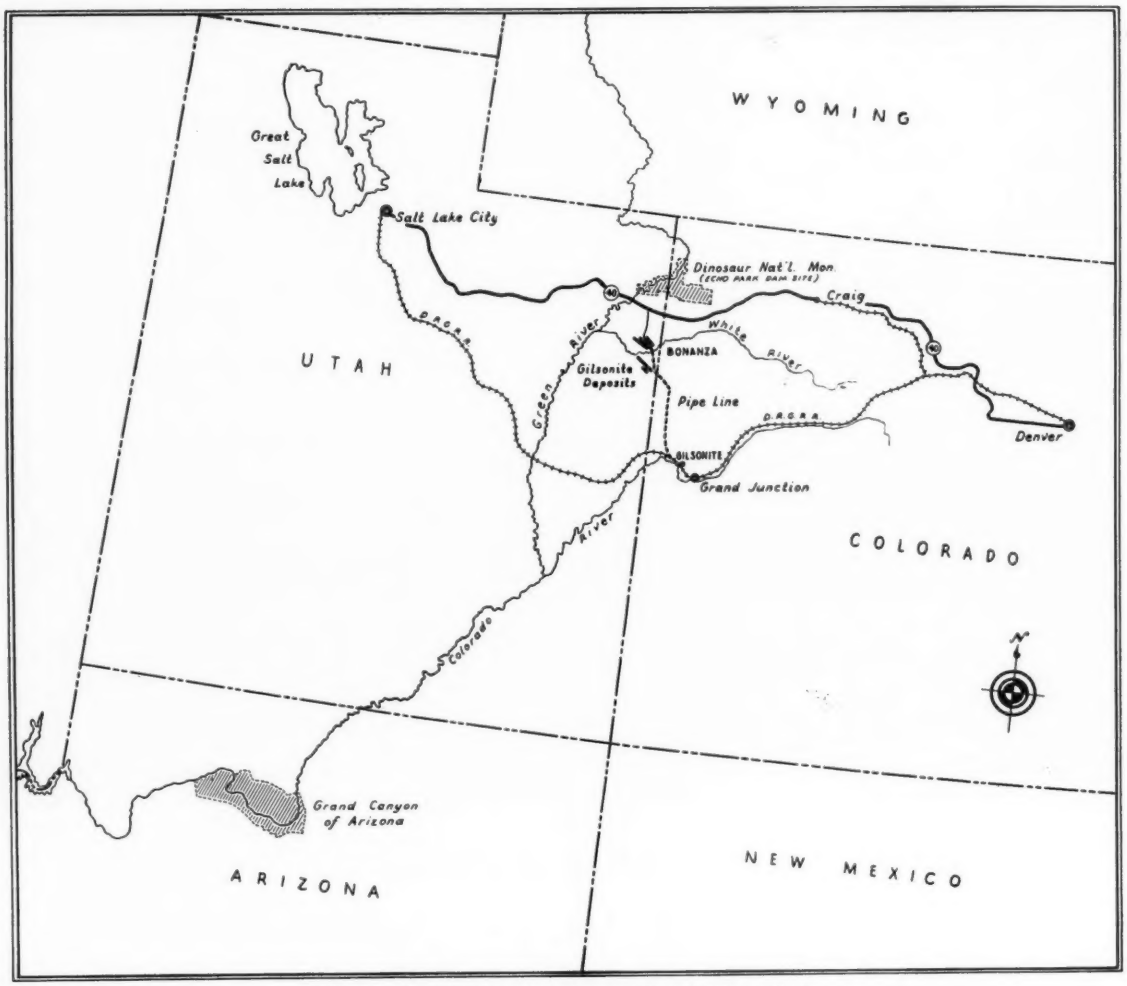
Using this study, Anaconda engineers designed the new Securityflex* cable – from the *inside* out. To combat the effects of constant flexing and impact, and occasional crushing, new neoprene insulation, new stranding of grounding conductors, and new nylon Anti-Short Breaker Strip were added to give it rugged *inner* strength as well as tough outer strength.

In addition – full, 50% grounding wire insures greater electrical protection, longer life, and extra safeguard against excess tension. Anaconda's flat, service-proven grounding wire allows more cable on reel—will not cut insulation if cable is crushed by runovers. Millions of feet of new Securityflex have been sold without a reported failure of grounding conductor. Insist on full-size grounding conductor for safety.

The Man from Anaconda has full details and samples for you. Call today, or ask your distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

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Map showing location of the large-scale Gilsonite project

Gilsonite

A $16,000,000 Project to Convert Gilsonite Into Coke and Gasoline Is Outlined in This Article

A DETAILED preview of the first, large-scale, privately financed project in the world to produce conventional petroleum products from a raw material other than crude oil was revealed in New York in mid-July.

Ernest F. Goodner, president of American Gilsonite Co. of Salt Lake City, Utah, which perfected the process of converting the unique, solid, hydrocarbon mineral "Gilsonite"* into high purity, electrolytoic coke for the aluminum industry and high octane gasoline, outlined the pioneering aspects of the $16,000,000 project.

* Trademark registered.

Work Has Been Started

The project involves a new processing plant to be completed in the spring of 1957 and the laying of one of the world's largest pipelines for transporting a solid material to link up the mines in Utah with the new refinery near Grand Junction, Colo. Every phase of the undertaking—mining, pipeline, and processing plant—will be characterized by distinctive features, and will represent a number of scientific and engineering "firsts." Work on all three phases has been started, as follows:

(1) At Bonanza, Utah, in the Uintah Basin, the center of the company's mining operations since 1904, where new "wet" mining techniques are being introduced;

(2) Over the intervening 71 miles of rugged mountain terrain, where a six-in. pipeline is being laid for transporting the Gilsonite in suspension from Bonanza to the Grand Junction plant. In the Book Cliff Mountains of Colorado at Baxter Pass, the pipeline will attain a maximum elevation of 8492 ft; and

(3) At Gilsonite, Colo., a newly-named location near Grand Junction where the processing plant is being located on a 1200-acre site. When fully operating, the plant will handle more than 600 tons of Gilsonite daily and employ 125 persons.

Geology

Gilsonite is a natural occurring solid hydrocarbon, having the scientific designation "Uintaite." The principal veins are located in the Uintah Basin of eastern Utah and western Colorado.

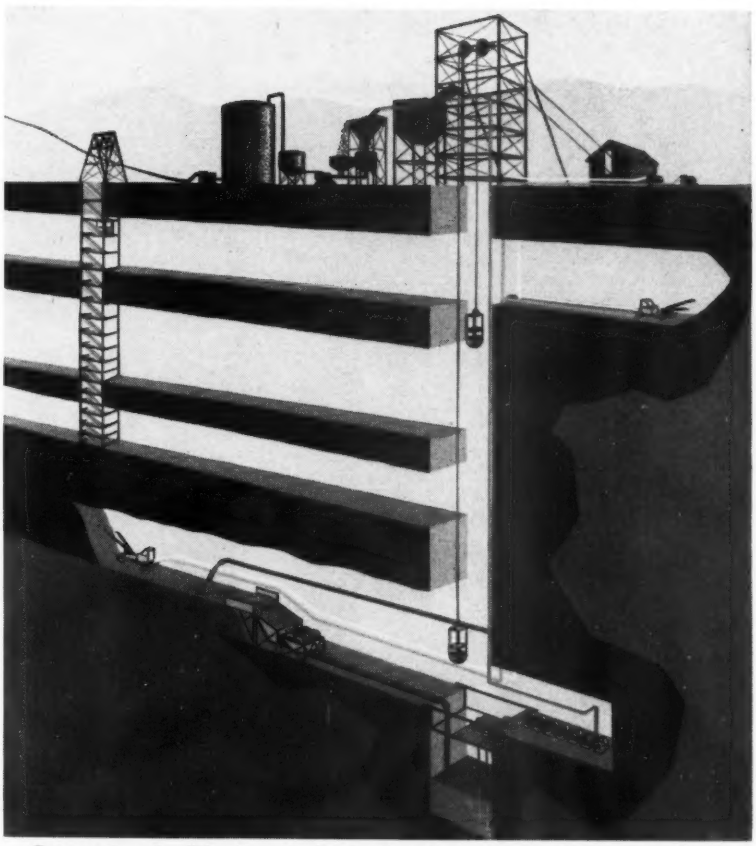
The ore is related to Wurtzilite, Ozocerite and Grahamite found in the same general area. Gilsonite technically is an asphaltite, but it is not an asphalt, having a high resin content and very little sulphur.

The precise origins of Gilsonite are uncertain. The most accepted explanation is that it was formed from the partial decomposition of organic material in shale formations, much in the same way that oil is formed. However, massive upheavals of the shale squeezed this organic material upward into stress cracks formed in the overlying beds of sandstone. These today are the vertical fissures from which Gilsonite is mined. During the intervening millions of years, the liquid organic material was changed, perhaps by polymerization, heat and the action of mineral catalysts, into the form known today.

The Gilsonite fissures strike northwest-southeast through the Uintah Basin, varying in width from a few inches to 22 ft. These veins have been mined to a depth of 1500 ft in the western end of the basin. The outcrop of one vein may be traced for more than nine miles, and some go down as deep as 2000 ft. The center of mining operations by American Gilsonite Co. is located at Bonanza, Utah, about 50 miles southeast of Vernal, Utah, and 125 miles west of Craig, Colo. All of the Gilsonite deposits in the basin are enclosed in an elliptical area about 10 miles wide and 60 miles long.

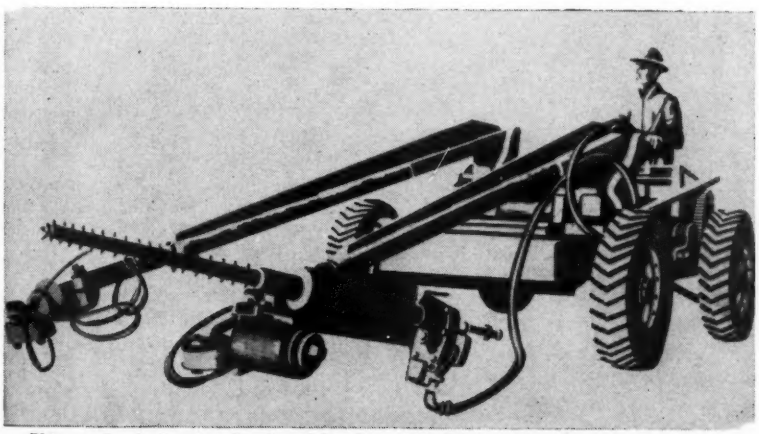
Economics

About 1885, Gilsonite found a use in the asphalt paving business. Since that time it has been mined and marketed continuously. It has been used as a constituent in such items as ink, phonograph records, roofing felts, paints, varnishes, battery cases, body sealers in cars, linoleum floor tile, electrical and thermal insulation.



Cross-section of a Gilsonite vein showing how the new hydraulic mining methods, developed by American Gilsonite Co., will be applied. A vertical shaft is first sunk, and slightly sloping drifts are cut at right angles to it. Hydraulic mining methods will be used exclusively, eliminating explosion hazards from Gilsonite dust. The cut ore is washed to the bottom of the shaft and raised to the surface in buckets. Two types of ore cutters are used

At the present time most of the ore is mined by a combination of mechanical and hand methods. It is then cleaned, sized and trucked to Craig, Colo., where it is packaged in 100-lb paper bags for shipment to all parts of the world. About 20 percent of the present production is shipped to foreign countries.



This mechanical cutter developed by American Gilsonite Co. uses a long, spiked rotary drill. Streams of water issue from the tips along the drill so that the ore is constantly kept wet. The ore is washed along the floor of the mine to the bottom of the main shaft where it is hoisted to the surface

New Mining Methods

Radically different and improved methods of mining Gilsonite have been developed for supplying the type of ore required for the new refinery and coke processing plant.

Mining this unique mineral has always presented problems. The earliest method was to pick away at the ore, letting it roll down an incline, where it was loaded into buckets and hauled to the surface. Until a short time ago, most Gilsonite was mined by mechanical modifications of this method. But, although it will not burn in the solid state, Gilsonite dust is highly explosive and this hazard is an ever-present one in the old mining methods.

Two new "wet" mining methods have been developed by the company over the past four years. Both methods reduce the explosion hazard and reduce the need for hand labor in the actual mining operations.

The first step in the new mining

method used to extract Gilsonite is to sink a shaft in the vein. Then, starting at a depth of 50 ft and continuing at regular vertical intervals, drifts are driven in both directions from the shaft and in the Gilsonite vein on a rising grade of about 2½°. When a drift is driven to its limit, a 10-ft bottom bench is begun at the shaft and the original drift floor is lowered one bench at a time. Benching continues until a vertical depth of about 350 ft is completely mined out. A 30-ft pillar is left and the next lower drift is started. As mining progresses a timber floor is put down on approximately 50-ft vertical intervals to provide overhead protection while mining succeeding benches. The timber floors actually consist of fine mesh chain-link fencing stretched tightly on and supported by horizontal stulls. This method protects the workers underneath but permits circulation of air.

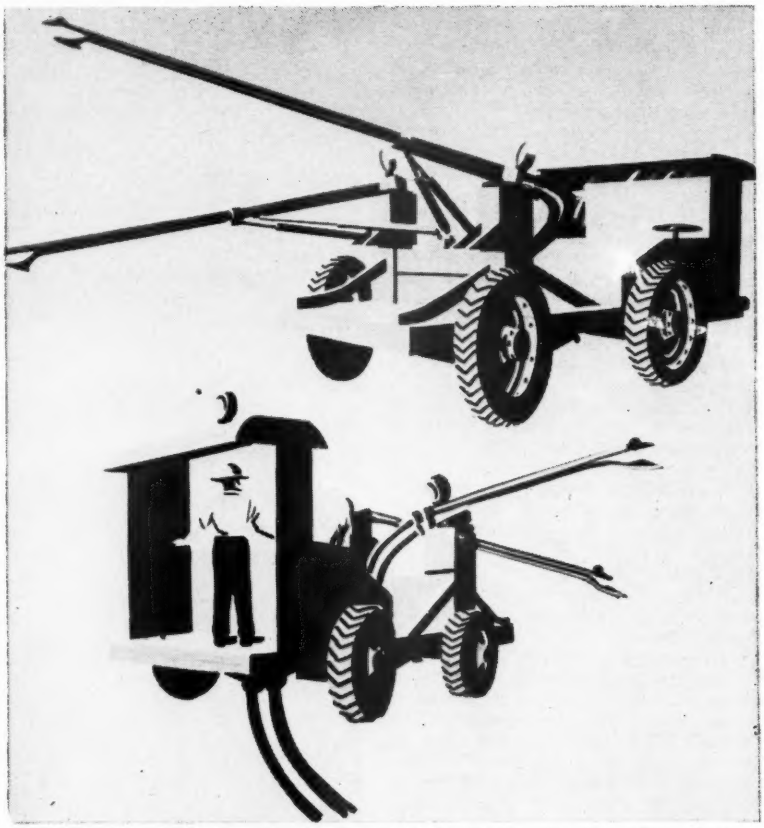
Actual mining is done by one of two methods of hydraulicing, depending on the type of ore mined. Some types of Gilsonite ore contain tiny cracks or fractures. In these veins, a powerful jet of water, issuing from a ¼-in. nozzle, with a pressure of 2000 psi, is played on the surface of the ore. The stream of water penetrates the tiny fissures and the ore breaks apart and falls to the bottom of the drift. The water that cut the ore, with the help of some low pressure water, washes it down the drift to the main shaft, down the shaft and across a dewatering screen where the plus ¾-in. material is removed to be hoisted to the surface. The water and minus ¾-in. Gilsonite ore are pumped to the surface with centrifugal pumps.

Another type of ore-cutting tool developed by the company consists of a long rotary drill armed with carbide-tipped teeth. The drill cuts a large swath through the ore and, meanwhile, streams of water pour out through the teeth, keeping the ore constantly wet throughout the entire operation. Again the ore is washed down the drift, to the main shaft for dewatering, and lifted and pumped to the surface.

This type of mining eliminates the hazard of Gilsonite dust. Transportation of the ore in water eliminates the possibility of dust becoming airborne in these large underground caverns. At present, the rotary drill method is employed in the Bonanza vein. The hydraulic jet method will be employed in the Cowboy, the largest Gilsonite vein in the world. Eventually, both methods will be used in all the mines of the American Gilsonite Co.

$2,000,000 Pipeline

The Gilsonite-water slurry will be pumped through a $2,000,000 pipeline to the Gilsonite, Colo., processing plant 71 miles away. It will be operated from a pipeline pump station at Bonanza, without an intermediate pump station. Discharge rate of the pipeline will be from 200 to 500 gpm. The pipeline will cross two canyons over specially-built suspension bridges: one 600 ft long over the White River; the other 700 ft long over Evacuation Wash Canyon. Except where it crosses the canyons, the line will be buried beneath the frostline.



Developed by American Gilsonite Co., the hydraulic jet cutter is used on those veins that occur with slight cracks. Streams of water (2200 psi) issuing from the nozzles tear the ore apart. The chunks are washed along the floor of the mine and then to the bottom of the main shaft where they are hoisted to the surface

Processing Plant

When the Gilsonite-water slurry reaches the processing plant, it will go through de-watering and melting processes to produce a liquid feed for the subsequent operations. Using a delayed coker, a fractionator and a catalytic reformer, the plant will convert the solid, brittle Gilsonite into 50 percent (by weight) green coke, 35 percent gasoline and 15 percent 1400-Btu gas which will be used as plant fuel.

Six hundred thirty tons per day of Gilsonite will flow into the processing plant; output will be 250 tons per day of coke, 1300 barrels per day of gasoline and 300 barrels per day of fuel oil.

The gasoline will be finished and blended for marketing in Western Colorado, now served from distant refineries and the coke will be calcined and shipped in covered hopper bottom cars primarily to markets in the northwestern part of the United States.

Made Plans For Los Angeles Yet?

See page 98 for what to expect at the finest Mining Show the West has ever seen.

Operators Corner

Air Conditioned Mine

Ice Warms Air in Winter and Cools It in Summer Months at Inco Stobie Mine

A UNIQUE air conditioning system that raises the temperature of cold air in the winter by making ice and uses the ice to reduce the temperature in the summer has been put into service at the Stobie section of the International Nickel Company's Frood-Stobie Mine in the Sudbury District of Ontario.

The mine fan that delivers air underground has a diameter of 198 in. and is one of the largest in the world. This powerful fan, which has a top capacity of 750,000 cfm, blows fresh air from the surface through a 300-ft vertical airway 20 ft in diameter into two huge open stopes mined for this purpose between the 300- and 500-ft levels. Each stope is 80 ft wide, 200 ft long and 200 ft high, and is separated from the other by a pillar 70 ft wide. The air circulates through the two stopes in succession on its way to the main intake.

Water from the mine's main pumping system is furnished at 120 psi to the four spray points at the top of each stope. The volume of water required in winter months varies up to 200 gpm. The fine particles of water sprayed into the air passing through the stopes turn to ice, and the heat given up in the process is transferred to the air. Some 40,000 tons of ice were formed at the bottom of the stopes during the past winter. This heat, along with that absorbed by the air from the large area of wall rock exposed in the stopes, added up to 15,000,000,000 Btu's, or the equivalent of burning 100,000 gallons of oil or 850 tons of coal, to the ventilating air.

Although the surface temperature during the winter ranged to 25° below zero, the fresh air delivered from the main intake of the mine ventilation system 600 ft below surface varied only between 27° and 30° above zero as a result of its side trip through the ice stopes. The temperature eventually is expected to be held at about 32° above zero as the system is improved.

When the volume of air handled through the system ultimately reaches full capacity of 750,000 cfm, as compared to 150, 000 to 300,000 cfm during the past winter, upwards of 140,000 tons of ice will be formed in the stopes during the winter months.

In the summer the ice is melted as the warm fresh air passes through the stopes, and the air is cooled between 5° and 10°. The humidity of the air is also reduced as it cools below the dew point and much of its moisture drops in the stopes. This phase of the Stobie air conditioning is similar to that at Inco's Creighton Mine, where fresh air being delivered to the mine is cooled by passing it through the natural refrigeration system in the old workings where seepage water freezes during the winter.

At other Inco mines where heating of fresh air is required during the winter, steam or oil installations are used. When the Stobie operation was being planned and it was noted that the logical position for the main fresh air intake lay near a low-grade section of the orebody conveniently located between the two main mining areas, the feasibility of establishing ice stopes presented itself. As a result, Stobie has been equipped with a remarkably efficient air conditioning system at a fraction of the cost of a surface heating plant.

Improved Ingot Design



One-ton lead ingots of new design can be easily handled by fork-lift trucks without the use of pallets

HANDLING of lead ingots has been simplified by the Bunker Hill Co. of San Francisco.

To meet the needs for economic handling of the metal by bulk consumers, a one-ton ingot for easy handling by fork-lift trucks was designed at the company's smelter at Kellogg, Idaho, under the direction of H. E. Lee, manager of metallurgy. The ingot is now a standard production item.

A fork-lift truck, approaching the ingot from any side, can engage the ingot between its forks, move it, and stack it trimly and firmly without pallets. The ingot, which requires less floor space than conventional pigs, can also be handled by an overhead hoist or crane.

Fifty, one-ton ingots comprise a regular carload and, while they cover most of the floor area, stacking is not necessary. Consumers have reported that a 50-ton carload now can easily and regularly be unloaded by fork-lift truck in less than an hour.



W. F. MUNFORD

Portrait by Fabian Bachrach

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MINING CONGRESS JOURNAL



Wheels of GOVERNMENT

As Viewed by HARRY L. MOFFETT of the American Mining Congress

AS THIS is written, the 84th Congress is on the last lap towards adjournment some time late in July. Daily sessions running to 12 hours in length, coupled with passage of a large number of bills in a very short period of time, featured the last few days of the session. Speeding adjournment was the desire of the lawmakers to participate in the national political conventions which begin August 13.

When Congress adjourns, all measures pending at that time fall by the wayside and must be re-introduced to be considered during the next Congress beginning January 1957.

During the last few days of the current session, the Senate, by a 51-41 vote, defeated efforts of public power advocates to approve Federal construction of a high level dam at Hell's Canyon. This resounding victory for the Administration was likewise a victory for free enterprise.

Caught in the adjournment rush and killed were measures which would have amended the Robinson-Patman Act to limit the "good faith defense" in cases of alleged price discrimination, and a measure which would have required industry to notify the Federal Trade Commission of any proposed mergers or acquisitions and wait for a 90-day period before making them effective. No further attempt was made to seek approval of legislation to authorize the United States' participation in the Organization for Trade Cooperation (OTC).

Marling J. Ankeny was confirmed as Director of the U. S. Bureau of Mines late in the session and was sworn in by Interior Secretary Seaton on July 20.

Social Security Law Revised

Senate and House conferees have reached agreement on differences in the Social Security revision measure and both Houses are expected to approve the bill and send it to the White House. Whether the President will sign it or not is a question at this time since it contains some features which the Administration has opposed. Most observers predict, however, that he will make it law.

The main features of the bill are the permitting of women to draw retirement benefits at age 62 and disabled workers to get payments at age 50. The Social Security tax would be increased a total of ½ per cent January 1, 1957. The House had previously voted for a one per cent increase in the tax rate. The present levy is two per cent each on employer and employe on the first $4200 of annual earnings.

Under the bill, women who choose to retire at 62 can draw annual benefits equal to 80 per cent of what they would be entitled to at age 65, while widows would receive full benefits at age 62.

The additional tax collected would be placed in a special trust fund to finance the disabled workers program.

The measure also extends social security coverage to some 200,000 self-employed persons.

It is expected that lowering of the retirement age for women may eventually result in pressure upon future Congresses to bring down the retirement age for men as well.

Mineral Purchase Bill Approved

On July 19, President Eisenhower signed into law a bill which extends the purchase programs for domestic tungsten, asbestos, fluorspar and columbian-tantalum for a two and a half year period. Purpose of the measure is to keep domestic mines healthy while the Federal Government develops a long range minerals program.

The measure as signed by the President is that which was approved by the House and which Administration officials had testified would be the only one acceptable to the White House. It authorizes the purchase of 1,250,000 short-ton units of tungsten at $55 per unit; 4000 tons of asbestos at prices in effect under Government buying programs on January 1, 1956; 250,000 tons of acid-grade fluorspar at a base price of $53 per short ton, and 250,000 pounds of columbian-tantalum-bearing ores at prices in effect on January 1, 1956. The new law limits to 5000 short-ton units the amount of tungsten concentrates which may be accepted from any one company's mines in any mining district in any month. It also provides that the Interior Department shall administer the programs instead of the General Services Administration, but gives the Department authority to turn the actual purchases over to GSA.

Immediately following approval of the law, officials of the Budget Bureau and the Interior Department asked the Senate Appropriation Committee for $91 million to carry on the programs. Congress, however, appropriated $21 million and the administration will seek additional funds next year.

The Senate approved a measure calling for continuation of the low grade manganese purchase program for a two-year period, but the House failed to act upon it.

Meanwhile, the Office of Defense Mobilization has taken steps to continue the domestic procurement programs for high-grade manganese, chromite, beryl, metallurgical-grade fluorspar and antimony, under terms of the Stockpiling and the Defense Production Acts.

Washington Highlights

CONGRESS: Set to adjourn
SOCIAL SECURITY: Liberalized
MINERALS PURCHASES: Program extended
TAX-TARIFF STUDIES: Scheduled
COAL RESEARCH: Hearings continue
METAL MINE SAFETY: Field hearings in fall
RENEGOTIATION ACT: Two-year extension
CUSTOMS PROCEDURES: Revised
AEC: Renews competitive leasing
PUBLIC LANDS: PL 167 regulation issued

Tax-Tariff Studies Approved

On July 10, the House Ways and Means Committee authorized the appointment of two special subcommittees, one to study the Internal Revenue laws and recommend changes therein, and one to review customs and tariff problems.

It is expected that Rep. Mills (Dem. Ark.) will head the tax study group while Rep. Boggs (Dem. La.) will be chairman of the tariff review.

The tax study is expected to encompass such matters as "loopholes," preferential treatment given some taxpayers, tax rates, and as a matter of fact may include the whole field of taxation. Hearings are expected to be held in the Fall.

The tariff study will embrace administrative and policy problems arising out of customs regulations, trade agreements, and the President's authority under the Trade Agreements Act. It is also expected to include a study of U. S. participation in the General Agreement on Tariffs and Trade (GATT). The Committee will probably begin its work in late August.

Meanwhile, Congress has approved measures providing for a two-year suspension of the import duty on alumina, and a continuation for two years of the suspension of duty on bauxite.

Coal Research Hearings Continue

Hearings before a House Interior Special Committee on Coal Research continued on July 19, with representatives of the American Mining Congress and the United Mine Workers of America testifying to the need for a broad program of coal research to increase markets for solid fuels.

Dr. William C. Schroeder, representing the Coal Division of the American Mining Congress and the Pittsburg and Midway Coal Mining Co., recommended that the Federal Government provide increased funds for coal research and that the research be administered through an agency such as the U. S. Bureau of Mines in the same manner as research programs are conducted by the Atomic Energy Committee, the National Advisory Committee for Aeronautics and the National Science Foundation. Thus, much of the coal research program could be put on a contract basis with private or institutional employes of the Government conducting the research.

He pointed out that total energy output will increase about two and a half times between now and 1980 and that coal will be called upon to assume its present share of the energy burden as well as some of that being supplied by oil and gas. He also pointed to the great strides that have been made by the coal industry in mechanizing its operations and improving its mining methods, and told the Committee that given freedom to go ahead in the future and treatment in the form of taxes and other legislation "as favorable as accorded our competitors" the industry can maintain and better its poistion. He said the coal industry is in serious need of increased research. He stressed the fact that the industry had done very well in the past to provide funds for research in the face of small profits, but pointed out that $3 million is being spent weekly by the oil industry for research and that the chemical industry is putting $7 million into research every week.

Schroeder pointed out that the coal industry is comprised of hundreds of small producers and that very few companies are large enough to conduct research on a scale which is most productive of results. He suggested that industry-wide cooperative research may be an answer to this problem, but that individual companies should continue to carry out their own programs since this insures the competitive drive created by the benefits derived when a single company's research effort is outstandingly successful.

He told the Committee that from the industry viewpoint the broad fields for coal research are as follows: estimation, location and characteristics of reserves; mining, preparation and marketing of coal; transportation; utilization for combustion purposes; production of coke and by-products; utilization for liquid fuels and gases; utilization for chemicals; and coal statistics. Of these fields he said the Government should take the primary responsibility for estimation, location and characteristics of reserves; the production of liquid fuels and gases from coal until such time as it may become commercially practical; and the gathering and distribution of coal statistics. He said that the industry considers the mining, preparation and marketing of coal to be solely an industry function. He suggested cooperative effort, either with government or with other industries, in research in these fields: transportation of coal, combustion, production of coke and by-products, and the utilization of coal for chemicals.

Rep. Saylor (Rep. Pa.) suggested that consideration might well be given to legislation which would permit coal companies, which were willing to expend funds somewhere between the present 10 percent depletion allowance for coal and the 27½ percent allowance for oil, to charge them off as capital expenditures for income tax purposes. Schroeder agreed that this would be helpful, and Julian Conover, executive vice-president, American Mining Congress, pointed out that an increase in the depletion allowance would benefit a substantial number of coal companies.

The UMWA stated that there are very few difficulties with respect to the mining of coal and that these problems should be left to the industry itself. The UMWA indicated that it hoped the Committee would look into car shortages on railroads and into possibilities for expanding coal's markets.

Chairman Edmondson (Dem. Okla.) said the Committee will hold hearings in various coal areas after Congress adjourns. It is understood that one such hearing will be held in Pennsylvania at which J. D. A. Morrow, Chairman of the Board, Joy Manufacturing Co., will testify on behalf of the Manufacturers Division of the American Mining Congress.

Metal Mine Safety Hearings

Chairman Barden (Dem., N. C.) of the House Labor Committee has named a special subcommittee to conduct field hearings this Fall on similar measures sponsored by Reps. Kelley (Dem., Pa.), Blatnik (Dem., Minn.), McConnell (Rep., Pa.), Metcalf (Dem., Mont.), Fulton (Rep., Pa.) and Saylor (Rep., Pa.), which would authorize the U. S. Bureau of Mines to inspect metal and nonmetallic mines in order to obtain information on health and safety conditions and causes of accidents and occupational diseases. This information would be publicly disseminated and the Interior Department would provide such information for Congressional consideration of legislative matters involving health and safety conditions.

Both the Interior and Labor Departments have opposed the enactment of such legislation.

The Special Committee which has been named is headed by Rep. Metcalf and the other members are Reps. Landrum (Dem., Ga.), Elliott (Dem., Ala.), Rhodes (Rep., Ariz.), and Fjare (Rep., Mont.).

Renegotiation Act Revised

Continuation of the Renegotiation Act for two years has been approved by Congress and will probably be signed by the President.

Under the latest version the floor under which contracts are not to be renegotiated was raised from $500,000 to $1 million. The measure redefines standard commercial articles to be those which are either customarily maintained in stock or which are covered by established price quotations. Standard commercial articles would be exempted from renegotiation if a contractor could show that 35 percent of his annual sales of these items was sold under non-renegotiable contracts.

As approved by Congress, the law continues the present provision which exempts from renegotiation any contract or subcontract for mineral raw materials.

(Continued on page 93)

AMC Personals

Paul Weir, chairman of the board, Paul Weir Co., has been elected to honorary membership in the Institution of Mining Engineers which is a federation of the eight institutes of mining engineers in Great Britain.



Election to honorary membership of this group is restricted to those who "shall have so distinguished themselves by their attainments, or have so contributed to the advancement of mining or other branches of technology, as to be approved and be elected by the Council (of the institution)." Three other Americans elected in recent years have been Eugene McAuliffe, formerly president of the Union Pacific Coal Co., now retired, George S. Rice, long with the U. S. Bureau of Mines, deceased, and Dr. Lewis E. Young, formerly a consulting engineer, deceased.

Potash Co. of America has announced the appointment of **J. B. Cummings** to administrative assistant in charge of exploration activities. Cummings had been resident manager of Potash Co. of America, Ltd., Saskatoon, Saskatchewan, Canada.

Courtland T. Dahlin resigned as general superintendent of mines for Lillybrook Coal Co. and Amigo Smokeless Coal Co. to accept the post of general superintendent for Princess Elkhorn Coal Co. at David, Ky.

Arthur J. Pugh succeeds Dahlin as general superintendent for the two companies.

John E. Stukel was recently appointed metallurgical sales engineer for The Cleveland-Cliffs Iron Co. at Cleveland. Stukel will be primarily interested in rendering metallurgical service between the iron ore mines and the steel industry.

He had been employed by the Youngstown Sheet & Tube Co. as a division metallurgical engineer in analyzing the problems relating to raw materials, pig iron and steel production.

Secretary of the Interior Fred A. Seaton has announced the appointment of **Elmer F. Bennett** to the position of assistant to the secretary, one of the top-echelon posts in the department. Bennett has been a special assistant to the Solicitor and legislative counsel for the department since 1953. In his new position, he succeeds **Raymond Davis** who on June 1, became deputy director of the Office of Industrial Resources of the International Cooperation Administration.

John B. Knaebel has been appointed assistant to the vice-president in charge of mining operations for The Aanaconda Co.

Knaebel has been associated with Anaconda in various operating capacities for ten years. Since 1951 he has been manager of the company's New Mexico operations which consist of



John B. Knaebel



Albert J. Fitch

mining and milling uranium ore. Under his direction the Jackpile mine was discovered, explored and developed. Anaconda's Bluewater Mill, near Grants, N. M., has been enlarged repeatedly under Knaebel's management.

Albert J. Fitch, formerly assistant manager, has been appointed manager of New Mexico operations. **E. C. Peterson,** formerly general mill superintendent, becomes assistant manager.

James M. Hamilton has been elected executive vice-president of Island Creek Coal Co. and **C. R. Mabley, Jr.** has been named president of Island Creek Sales Co.

Hamilton had been vice-president of operations since 1949 when he joined Island Creek from Republic Steel Corp.

Mabley was vice-president in charge of sales for Island Creek.

The American Metal Co., Ltd., announces the election of **Jean Vuillequez** as a director. Vuillequez joined the company in 1927 and has been a member of its sales department since 1935. In 1943 he was appointed assistant manager of sales and later became director of sales. In 1953 he was elected a vice-president of the company. He succeeds **Bernard N. Zimmer** who retired in 1954 as a vice-president of the company and who had served on the board since 1923. Zimmer had requested not to be nominated for re-election for a further term.

The appointment of **William G. Maloney** as secretary-treasurer of the Mining Association of Montana has been announced by F. E. Burnet, association president. He succeeds the late Carl J. Trauerman, who was secretary-manager.

Maloney has been a miner, shift boss and mining safety engineer. He held engineering positions under the county surveyor and the State Water Conservation Board, was executive assistant state administrator for the Montana Relief Commission and regional safety engineer for the Farm Security Administration, and from 1938 to 1947 was supervising inspector in Montana for the U. S. Department of Labor. Maloney also served six years as district manager for the U. S. Department of Commerce field service in Montana. Since 1953 he has been on the staff of Senator James E. Murray.



James W. McDivitt, preparation manager of Ayshire Collieries Corp., Indianapolis, has announced his retirement after 28 years with the corporation. He was in charge of all Ayrshire preparation plants and had been responsible for their design.

James J. Merle, assistant to McDivitt, was appointed to succeed him effective July 1. He joined Ayrshire in 1940 as chief chemist.

Appointment of **Richard B. Davern** as assistant treasurer of United States Steel's Oliver Iron Mining Division has been announced by R. T. Elstad, president. At the time of his appointment Davern was supervisor of accounting division for Oliver.

Succeeding Davern as supervisor of accounting is **Thomas G. Barry,** supervising senior auditor at Duluth for U. S. Steel Corporation's internal audit division.

At the recent annual meetings of the shareholders and directors, **Stanley B. Johnson** was re-elected to president of The Lorain Coal and Dock Co. and to chairman of the board of The Lorado Coal Mining Co. **Stanley B. Johnson, Jr.,** was renamed president of The Lorado Coal Mining



S. B. Johnson, Jr.



R. I. Seith

Co. and elected to executive vice-president of The Lorain Coal & Dock Co.

James R. Johnson announced his retirement as vice-president of both companies. **Frank A. Burke** was elected to vice-president in charge of sales of The Lorain Coal and Dock Co. and **Robert L. Seith** was named vice-president of The Lorado Coal Mining Co.

Robert J. Linney has been elected to the new position of vice-president in charge of operations of Reserve Mining Co., according to W. M. Kelley, president of the $190 million taconite processing company.



Linney has been manager of operations for Reserve, which is owned jointly by Republic Steel Corp. and Armco Steel Corp., since he joined the company in 1950.

A. V. Sproles, Jr. has been appointed director of labor and personnel relations of the Pocahontas Fuel Co. Sproles had been appointed superintendent of the Angle Colliery of the company on April 7. He will continue these duties for the present.

Sproles succeeds **Joseph C. Turley, Jr.,** who had been director of labor relations for the past several years and who terminated his services with the company on May 31. Turley is being retained in an advisory and consulting capacity.

Charles F. Barber has been appointed general counsel of American Smelting and Refining Co. **R. Worth Vaughan,** executive vice-president and former general counsel, will now devote full time to his broadened responsibilities of executive vice-president.

James M. Goodwin, assistant general manager and chief engineer, who has been associated with Pocahontas Land Corp. and its predecessor, the Pocahontas Coal & Coke Co., for the past 41 years, retired from active service July 1. **Douglas F. Crickmer,** assistant chief engineer, has been promoted to chief engineer, and **Benjamin Lazer,** chief mine inspector, became assistant chief engineer and chief mining inspector.

Metal & Thermit Corp. has named **Owen Richards** manager of its new mine and titanium ore dressing plant now under development at Beaver Dam, Hanover County, Va. The new plant, which will produce both rutile and ilmenite, is scheduled for completion in the fall of 1956.

James D. Francis, president of The Powellton Coal Co. since it was organized, has been elected chairman of the board. The presidency will be filled by **David L. Francis,** who has been serving as vice-president as well as



James D. Francis



David L. Francis

president of Princess Elkhorn Coal Co. and of Princess Coal Sales Co. James D. Francis will continue as chairman of the two affiliated companies.

Other executive changes announced include the retirement of **G. J. Stollings** as executive vice-president of the three companies. Stollings had asked to be relieved of his duties, but will continue as consultant and advisor. **William Crawford,** who has been vice-president and general manager of Princess Elkhorn for ten years, was elected vice-president in charge of operations of the Princess Elkhorn and Powellton companies. **Courtland T. Dahlin,** general superintendent at Princess Elkhorn, succeeds Crawford as general manager of that company. **John Straton** has been promoted from director of industrial engineering to general superintendent and **Gene Matthis** has been appointed director of industrial engineering.

— *Obituaries* —

A. J. McNab, 78, chairman of the board of Magma Copper Co. and San Manuel Copper Corp., died July 4. He was a vice-president and director of the Hudson Bay Mining & Smelting, Ltd., and a director of the O'Okiep Copper Co., Ltd.; Tsumeb Corp., Ltd., and Newmont Mining Corp.

Born in Ontario, Canada, Mr. McNab started his career in 1903 with what is now the Consolidated Smelting & Mining Co. of Canada. In 1910 he worked for the Gunn-W. B. Thompson mining interests at Mason Valley, Nev. He became associated with Newmont Mining Corp. in 1915 and in 1920 was made a vice-president of Magma Copper Co.

Widely known in the copper industry, it was he who envisioned the San Manuel project and lived to see it carried out successfully.

Mining Congress Journal Staff Member Dies

JERRY J. WARD, Assistant Production Manager of the MINING CONGRESS JOURNAL died suddenly in Washington, D. C., July 8, following a brief illness. He was buried with military honors in Arlington National Cemetery.



Mr. Ward came to the American Mining Congress and the Journal in 1946 following distinguished service with the Army in the Pacific during World War II.

In addition to contributing to the constant development of MINING CONGRESS JOURNAL from a standpoint of typography, layout and format, "Jerry" found time to render great assistance in connection with the Expositions held by the Mining Congress, in both the coal and the metal mining and industrial minerals fields. During these expositions he became well known to many manufacturers of mining equipment for the friendly, courteous service he always rendered.

His passing leaves a great void at the headquarters of the American Mining Congress and he will be sorely missed by his colleagues.





Thomas Is NCA President

L. Newton Thomas, president of Carbon Fuel Co., Charleston, W. Va., is the new president of the National Coal Association. His election was announced at the conclusion of NCA's Convention held in Washington, D. C., June 13-14. Thomas succeeds L. C. Campbell, vice-president of Eastern Gas & Fuel Associates, Pittsburgh, who served as the Association's president for four years. NCA's board of directors expressed its regret of Campbell's desire to relinquish his duties and expressed the membership's warm thanks for his services to NCA and the coal industry.

NCA's board elected these four vice-presidents: Harry LaViers, president, South-East Coal Co., Paintsville, Ky.; H. Vernon Fritchman, vice-president, Rochester & Pittsburgh Coal Co., Indiana, Pa.; James W. Morgan, president, Ayrshire Collieries Corp., Indianapolis, Ind.; and Kenneth A. Spencer, president, Pittsburg & Midway Coal Mining Co., Kansas City, Mo.

Tom Pickett was reelected executive vice-president; John L. Kemmerer, Jr., vice-president, Wise Coal & Coke Co., New York, was reelected treasurer; and Carl C. Crowe was reelected secretary and assistant treasurer.

Eight members, including Fritchman and Morgan, were elected to serve on the Executive Committee. The others are: Charles R. Griffith, president, Southern Coal & Coke Co., Knoxville, Tenn.; H. R. Hawthorne, general counsel, Pocahontas Fuel Co., Inc., New York; R. L. Ireland, chairman of the board, Hanna Coal Co., Cleveland, Ohio; L. Russell Kelce, president, Sinclair Coal Co., Kansas City, Mo.; R. H. Knode, chairman of the board, Stonega Coke & Coal Co., Philadelphia, Pa.; and R. E. Salvati, president, Island Creek Coal Co., Huntington, W. Va. Thomas is ex-officio chairman of the committee, Campbell is a member of the committee as retiring president, and Kemmerer serves on the committee by virtue of his office as treasurer.

Mine Safety Ceremony

More than 400 employes at Glen Rogers No. 2 mine of Raleigh Wyoming Company, Glen Rogers, W. Va., were honored at a recent ceremony for 100 percent participation in the U. S. Bureau of Mines' accident prevention course.

The Bureau, the W. Va. State Department of Mines, and the UMWA joined forces at a ceremony held in Glen Rogers theater to honor the mine's working force for completing the ten-week course. The three groups each presented certificates signifying achievement to representatives of management and UMWA Local No. 6004 for the part they played in the training record.

Receiving certificates from the State and Federal agencies were Walter S. Brooks, underground superintendent; Francis Harrington, surface superintendent; and Frank Pizzino, briquette plant superintendent. J. Hunter Thomas, president of Local No. 6004, received certificates from these two agencies and the United Mine Workers.

Glen Rogers No. 2 was the 302nd mine in the United States to complete 100 percent participation in the Bureau's accident prevention course.

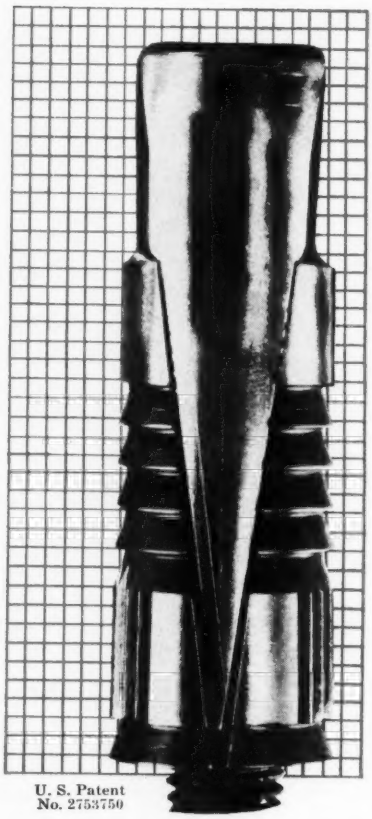
Name Mine After Geo. Love

In honor of its president, George H. Love, Pittsburgh Consolidation Coal Co. has renamed one of its new Northern West Virginia properties the "Loveridge Mine."

Located near Fairview, W. Va., the mine formerly known as Jamison No. 22 was placed under development in January of this year by Consolidation Coal Company (W. Va.) Division of Pitt Consol. Its location in the Pittsburgh Seam with approximately 12,000 acres of reserves gives Loveridge Mine a life expectancy of at least 40 years with an annual production scheduled to exceed 2,000,000 tons by 1958.

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Virginia Zinc Mine

Tri-State Zinc, Inc., New York City, is opening a zinc mine near Harrisonburg in northeastern Rockingham County, Va., and will construct a $500,000 mill.

C. E. Stover, formerly of Miami, Okla., will be general superintendent and Albert Kennedy of Baxter Springs, Kan., will be mine superintendent.

Mining engineers have made bore hole tests which indicate zinc in sufficient quantities in one body of ore to warrant an expectation of 750 tons of ore a day over a period of five years. No lead has been found in the bore holes, but some lead and zinc have been found in the workings of an old shaft dating back to the Revolutionary War.

The mill will employ about 40 men when it reaches its 750 tons per day rate early next year.

Princess Elkhorn Scholarships

Princess Elkhorn Coal Co., David, Ky., has awarded four scholarships this year to outstanding seniors in Floyd and Johnson Counties, Ky., boosting to 50 the number of such grants made during the past 12 years. The awards include two four-year grants for the study of engineering and two two-year grants.

All of the recipients of the scholarship awards are sons and daughters of employes of Princess Elkhorn Coal Co. except one, a son of an employe of the Collins Mining Co., Garrett.

New Cleaning Unit

Lake Superior Coal Co. has contracted with Kanawha Manufacturing Co. for installation of a 300 tph preparation plant to be completed in March 1957 at its mine at Superior, McDowell County, W. Va.

Under another contract with Lake Superior, Kanawha Manufacturing Co. will install dumping and weighing equipment, including a dump chute with motorized rock by-pass, a power-operated weigh basket, and a heavy duty pipe lever scale, with a capacity of 300 tph.

Explosion Warning

Twenty nonfatal ignitions of explosive gas in the nation's coal mines in recent months caused the Department of the Interior to caution mine operators that major disasters may occur unless greater attention is given to improved ventilation and to use of safer mining equipment.

All but two of the 20 ignitions reported thus far in 1956 were in face regions. Cutting machines ignited gas in the kerfs in nine of the mishaps, six of these being caused by electrical sparks from ground faults and three by friction sparks thrown off by the cutter bits. In another instance, gas at the working face was ignited by friction sparks from the cutter bits of a continuous mining machine.

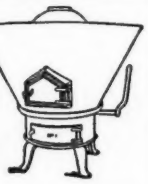
Short-circuiting of damaged electrical cables ignited gas at two of the mines, and open-type electrical face equipment was the ignition source at two others.

Faulty blasting in rock, a defective flame safety lamp, and an open-flame cap lamp caused one ignition each. In one mine, combustible gases generated by a fire were ignited by the blaze. In another mine, methane was ignited by a rekindled fire.

Titanium Processing Expansion

Crucible Steel Co. of America and its affiliate, Rem-Cru Titanium, Inc., have announced a joint $400,000 improvement program for increasing titanium processing facilities at Cru-

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Improvements, which will double capacity for rolling titanium sheet, include installation of a continuous double-row furnace for heating titanium slabs, the erection of a new building to house a bar yard and auxiliary titanium processing equipment, and the remodeling of a sheet mill. Improved facilities will be used for titanium processing exclusively.

Drilling Symposium

The University of Minnesota will present its sixth annual Drilling Symposium, October 11, 12, 13, 1956, at the University Center for Continuation Study. The subject chosen by the Planning Committee for treatment at the Minneapolis, Minn., meeting is drilling and blasting operations.

Asbestos Mill Contract

Lake Asbestos of Quebec, Ltd., has let a $7,700,000 contract to F. H. McGraw Co. of Canada, Ltd., for construction of a large asbestos ore-milling plant, capable of treating 5000 tons of ore per day. Lake Asbestos is a wholly-owned Canadian subsidiary of American Smelting & Refining Co.

Work on the mill, already begun, is expected to be completed early in 1958. More than $9,000,000 will be spent for the structure and milling machinery to be used for separating the asbestos fiber from its ore. Approximately 100,000 tons of fiber annually will be produced at the Lake Asbestos mill.

Asbestos ore for the new mill will come from ore bodies which now lie 70 to 200 ft beneath the waters of Black Lake, which is situated about 130 miles east northeast of Montreal. This lake is now being dredged of approximately 1,000,000 cu yd of solids each month.

About 350 persons will be employed in the operation when it is in full swing. Asarco expects to spend more than $32,000,000 to develop this asbestos mine.

For Sale or Trade

One—Joy Continuous Miner for sale or to trade for shuttle cars, cutting machines, loaders or other mining equipment. Specifications as follows:

No. 3JCM-2BE Joy continuous miner, 250 volts D.C., U.S. Bureau of Mines permissible plate, approval No. 2-773, serial No. JM-247, complete with No. 4-WS-2 Joy skid mounted high pressure water spray unit, 250 volts D.C., permissible plate, serial No. WS-157, and including approx. $14,000 worth new spare parts for above continuous miner.

Above was purchased in 1950, but has been out of production for the past two years and is in excellent condition. Equipment may be inspected at your convenience. If interested in purchasing or making any trades for the above, please communicate with

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Columbus 15, Ohio

New Bureau of Mines Chief



Marling J. Ankeny, right, was sworn in July 20 as Director of the U. S. Bureau of Mines while Secretary of the Interior Fred A. Seaton, center, looked on. Ankeny succeeds J. J. Forbes who retired last November. Since 1952, Ankeny has been safety director of the Bituminous Coal Operator's Association. Prior to this, he spent 24 years as an official of the U. S. Bureau of mines and was chief of the Coal Mine Inspection Branch from 1948 to 1952. In his earlier years, he worked his way up in various coal mining jobs from coal miner through various supervisory positions to safety direction, serving with several coal mining companies.

Safe Workers

A perfect safety record for nearly two years—5,500,000 man-hours without a lost-time accident—has earned the main plant of Mine Safety Appliances Co. an Award of Honor from the National Safety Council.

Receipt of the award was acknowledged by the company during a special "Safety Day" observance. Board chairman G. H. Deike, Sr., and vice-president E. G. Sanner spoke to employes, thanking them for their cooperation with the safety program and urging continued safe practices.

Everglades Cement Plant

Lehigh Portland Cement Co. will build a $20,000,000 cement manufacturing plant on a 3500-acre tract in the Everglades, seven miles west of the International Airport at Miami, Fla., with operations scheduled to begin within two years.

Lehigh already operates a cement plant at Bunnell, in northeast Florida, and after completion of the new plant it will have more than $50,000,000 invested in its Florida operations.

The new plant will reclaim coral from beneath the sawgrass and the muck of the Everglades; the Bunnell plant utilizes coquina shell.

Coal Pipeline Progresses

Although plagued by heavy rains earlier this year, workmen on Ohio's 110-mile coal pipeline expect to push the line to Greater Cleveland by the end of this month.

The ten-in. line will carry slurry from mines near Cadiz to a power plant east of Cleveland. The coal will be pulverized and mixed with water at a plant at Georgestown, southeast of Cadiz, and piped to the power plant at Eastlake, on Lake Erie. Enroute there will be three pumping stations—at Cadiz, Carrollton and Atwater.

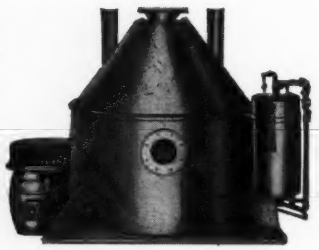
When the line is operating, it will be manned by six men—two at each pumping station—and it will deliver 1,300,000 tons of coal a year on a 24-hour per day operational basis.

The line is being built for Pittsburgh Consolidation Coal Co., which has a 15-year contract to deliver coal by pipe to the Cleveland Electric Illuminating Co. power plant.

Adds to Preparation Unit

Royalty Smokeless Coal Co., Clifftop, W. Va., has entered into contracts with Kanawha Manufacturing Co. and Eimco Corp. for installation of additional equipment at the firm's Royalty coal preparation plant.

The Kanawha Co. will install a fine coal recovery system with capacity of 17 tph of recovered coal. The Eimco contract covers a coal type vacuum filter and auxiliary equipment with a capacity of 20 tph.



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Salt Sought Under Lake

International Salt Co., Scranton, Pa., is conducting a $1,000,000 drilling program to determine if a salt mine can be developed under Lake Erie off Cleveland's West Side.

If salt can be economically recovered, the company's plans call for an inclined shaft, starting on Whiskey Island, in the mouth of the Cuyahoga River, and extending 6000 ft out under Lake Erie at an approximate 30° slope. At the bottom of the slope would be the mine, 2000 ft under the surface of Lake Erie.

The company's crews are working at six spots, including one on a breakwater 2000 ft from shore, and the drilling will go on all summer.

Engineers estimate there are billions of tons of salt under Cleveland.

Venezuela Bauxite

The Venezuela Ministry of Mines has announced the discovery of large deposits of commercially minable bauxite in the State of Bolivar. The government estimated that the deposits contained about 10,000,000 tons of ore, with samples showing a 40 percent aluminum content.

The deposits are located in the mountain region some distance from water transportation, thus reducing the commercial value of the ore.

Taconite Project Dedicated

The huge taconite processing project of Reserve Mining Co. at Babbit and Silver Bay, Minn., was formally dedicated on August 9, signifying the opening of a vast new domestic source of high-grade iron ore.

The project includes the world's first large-scale taconite plant, It is designed to produce 3,750,000 tons of iron ore pellets annually for Armco Steel Corp. and Republic Steel Corp., joint owners of Reserve.

The entire project includes the large processing plant at Silver Bay, the smaller processing plant at Babbitt, the taconite mine, a 47-mile interdepartment railroad, a harbor, a 50,000-kw power plant, and two modern communities.

Killarney Mine Re-Opened

Twenty-one months of idleness at Killarney mine of Lillybrook Coal Co. near Lego, W. Va., ended recently as coal once more began rolling out of the operation. Maintenance crews had been occupied for about a month in the mine's underground workings cleaning up slate and rock falls, applying rock dust, and doing a general clean-up job.

Resumption of coal output at Killarney means that all of Lillybrook's major operations again are in production. Other mines in the immediate area that are operated by the company are Lillybrook, Affinity, Amigo, and Wyco, all of which were closed at one time but have resumed production.

The Killarney mine, which employed 250 men when closed in 1954, will provide work for about 175 men, according to R. B. Williamson, president of the company. It will operate on a hand-loading basis and is expected to produce about 1000 tons per day.

For Sale

One 22 HD Sullivan Core Drill Complete with Power Unit; Excellent Condition. Priced for Immediate Sale.

MONONGAHELA MACHINERY & EQUIPMENT CO.
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Preliminary Work Set

Directors of the Hudson Bay Mining & Smelting Co., Ltd., have authorized development work, including construction of a road, a power line and the sinking of a shaft, at the company's new gold-silver-copper-zinc discovery in the Snow Lake area of Western Manitoba.

The new discovery is some 75 miles east of Hudson Bay's main property at Flin Flon, Manitoba.

Biwabik Mine Worked Out

Minnesota's famous Biwabik Mine, second oldest on the Mesabi Iron Range, is worked out. Discovered in 1889, it produced more than 25,000,000 tons of rich ore during the past 62 years, most of it going to steel plants in the Youngstown, Ohio, area.

The Biwabik Bessemer Co. operated the mine from 1894 to 1897. In 1898 it was operated by Biwabik Mining Co., with Todd-Stambaugh & Co. of Youngstown as agents. In 1912 Biwabik Mining Co. became a part of the newly organized Brier Hill Steel Co. of Youngstown. Youngstown Sheet & Tube acquired Biwabik Mining Co. in 1923 when it bought Brier Hill Steel. Pickands Mather & Co. of Cleveland had operated the mine for Sheet & Tube since 1924.

The mine introduced many innovations in iron ore mining. In 1892, the first steam shovel used on the Mesabi range was used to open the Biwabi pit. In 1909, the largest ore crusher of its kind was installed, and the mine was one of the first to use truck hauling.

Four men served as superindentents of the mine in its 62 years. The first was a Mr. Schilling, for whom a grade of ore was named. The others were J. S. Lutes, Frank S. Dane, and J. M. Shields, who served from 1933 until the mine closed down.

Wheels of Government

(Continued from page 86)

Customs Procedures Revised

A compromise measure to review U. S. Customs procedures has been approved by the House, and favorable Senate action is expected before adjournment. This bill has long been sought by the Administration and will be signed by the President when it reaches the White House.

Under terms of the measure, the basis for levying ad valorem duties will be changed. Such duties are now based on the price for which the article is sold in the country of origin or on the price for which it is exported to the United States, whichever is higher. The new Act would make the export price the sole standard of arriving at duties. It also carries a provision which would prevent the new system from going into effect on any item where the result would be to reduce tariffs by five percent or more unless Congress specifically approved the proposed change on that item.

AEC Turns to Competitive Leasing

The Atomic Energy Commission has initiated a system of competitive bidding for leasing uranium deposits on withdrawn public lands and on lands under AEC control, thus replacing the former system of negotiating all leases.

AEC said that extensive leasing of lands under its control is not contemplated now, but it will call for bids when additional uranium deposits are needed in its program. For such deposits as are offered for lease, invitations to bid will be publicly posted and published, and copies will be supplied those who ask the Grand Junction Operations Office to place their names upon the invitation-to-bid list. Leases will be awarded to the acceptable bidder offering the highest cash bonus by sealed bid.

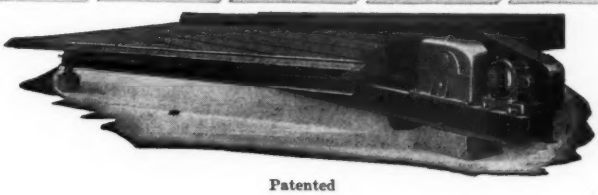
AEC also revealed that in exceptional circumstances leases may continue to be negotiated where it will be to the interest of the Government to do so. Extension of existing leases may also be negotiated.

Interior Issues Public Law 167 Regulations

Proposed regulations for administering Public Law 167, which provides for multiple use of surface resources not needed in actual mining operations on public lands, have been issued by the Interior Department.

Under the law, which was supported by the mining industry when it was before Congress, Federal agencies have control of surface resources not needed for prospecting, mining, processing and related operations, on public lands covered by unpatented mining claims located after July 23, 1955. On claims located prior to that date a process is established for determining surface rights or for mining claimants to waive such rights if they so elect.

The proposed regulations amplify the language of the law to set forth in detail the rights of the Government and of mining claimants with respect to the surface resources, procedures for ending title uncertainties, types of notices required, hearings precedures, the effect of hearings determinations, and to make it clear that all rights of mining claimants existing on the date of the Act are preserved. The Interior Department has declared that written comments, suggestions, or objections regarding these regulations should be submitted to the Bureau of Land Management, Washington 25, D. C. prior to August 10, and that the regulations will not be placed in effect until full consideration is given the views submitted.



Patented

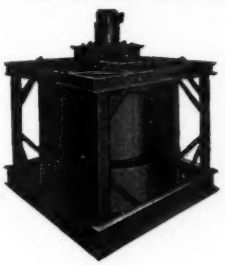
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Columbium Ore Discovered

Dominion Gulf Oil, subsidiary of Gulf Oil Co., Pittsburgh, has conducted preliminary drilling indicating that large tonnages of columbium ore may be readily available at a location on Nemegosenda Lake, 17 miles northeast of Chapleau in Ontario.

The company began ore drilling more than a year ago, and over 16,000 ft of drilling has convinced geologists that the area of columbium mineralization is one of major importance. The drilling followed indications of possible columbium mineralization obtained with an airborne magnetometer in 1954.

J&L Searches for More Iron Ore

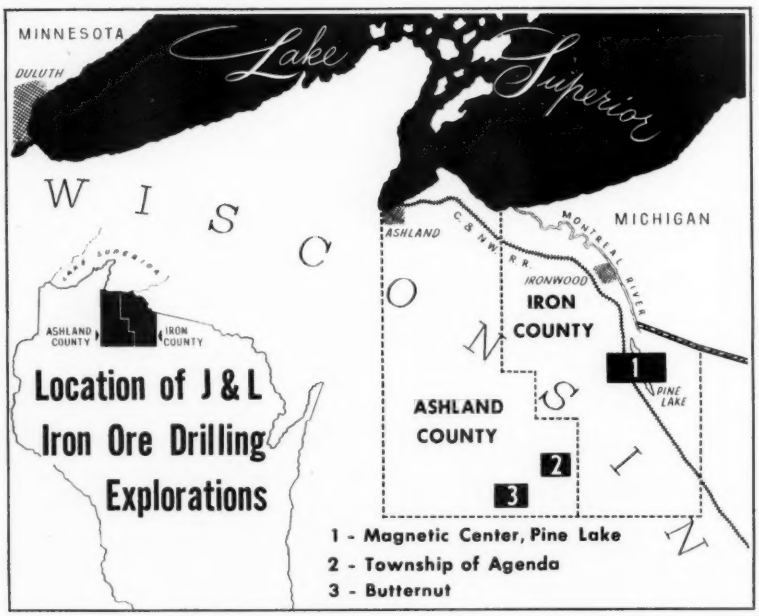
Jones & Laughlin Steel Corporation's search for additional reserves of iron ore has been extended to Ashland County, Wis., where J&L has started an exploration program on lands it has optioned. The properties are located near the Village of Butternut and in the Township of Agenda. They include approximately 1600 acres.

Options, which terminate at the end of 1957, were negotiated for purchase of some of the properties and for lease of others, if the exploration work indicates iron bodies in economic quantities. Diamond drilling is being done under contract with the E. J. Longyear Co. of Minneapolis.

These new explorations are about 35 miles away from another J&L exploration site on lands owned by Iron County, Wis. The Iron County lands are located in the Pine Lake area north of Mercer. They are being explored under an option agreement initiated in 1955.

The decision of the corporation to option the Ashland County properties and explore for iron ore was reached after preliminary geophysical surveys indicated the possible presence of economic quantities of magnetic iron formation or taconite which might be recovered by open pit mining.

The magnetic "attractions" in the Ashland County area have been known for many years. Some of them have been reported in publications of the Wisconsin Geological Survey. However, little detailed exploration work has been done, because it was felt that the possibilities of finding high-grade ores were not good, and because surface showings of iron-bearing rocks are either rare or entirely absent.



Bedrock in much of the area is covered by 100 to 200 ft of glacial drift. Detailed geophysical surveys are being conducted to supplement the present diamond drilling program, which will be completed this year. If preliminary exploration results are favorable, additional drilling will be done in 1957 to outline in more detail the ore bodies within the optioned area.

Another J&L exploratory site is located in the Province of Quebec, Canada, 200 miles north of the iron ore port of Seven Islands and 40 miles from the Quebec, North Shore & Labrador Railway. J&L recently announced plans for a two-year exploration of this site.

Wanted

Electric driven hoist, vertical balance, skip duty, 3900 ft depth, rope speed to 2500 ft per minute, 60,000 lbs. Single rope pull, hoisting from single level, for 3000 ton/day Canadian Mine.

Submit full particulars including price and delivery date to

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Eastern Uranium Mill

Vitro Rare Metals Co., a division of Vitro Corporation of America, is ready to break ground for extensive additions to its Canonsburg, Pa., plant. An expenditure of more than a million dollars will establish the first commercial primary uranium processing plant in the Eastern United States. It will also give the plant new facilities for a recently developed solvent extraction process, which the company says offers increased efficiency.

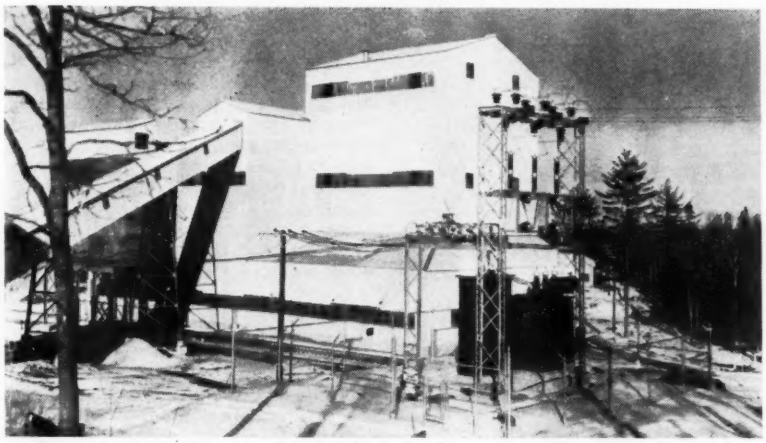
The new plant will double the old facilities in size, will allow technical and reagent grade chemical production, and will permit the milling and processing of uranium, particularly the residues. Previously the Canonsburg plant had been equipped for the hydro-metallurgical processing of uranium ores and other metallic waste materials, and for the refining and recovery of rare metals for industrial use.

The Canonsburg plant was established in 1909 for the processing of vanadium ores, and was involved in the production of radium in World War I, becoming the largest producer in the United States. In 1921 Mme. Marie Curie was presented with the first gram of American radium, produced in this plant.

Uranium was present in the same ores processed for vanadium and radium, but until World War II it was comparatively unimportant, being used only in small quantities for ceramic colors. At one time Canonsburg discarded large quantities of uranium which were later recovered for the government's atomic energy program.

Indications are that the plant will be ready for extensive uranium milling and processing in about eight months. Vitro Engineering Division of New York is doing the design and engineering, and construction is by The Refinery Engineering Co. of Tulsa, Okla., both also divisions of Vitro Corp. Sufficient quantities of uranium ores and residues have been assured the new plant to fulfill processing schedules.

Three New International Mining & Chemical Plants



New mine and plant recently started up by International Minerals & Chemical Corp., at Blue Mountain, Ontario

INTERNATIONAL Minerals & Chemical Corp. has recently started up three new plants in the corporation's Industrial Minerals Division. One is in Ontario, one in Tennessee, and the other in California.

The one and one-half million dollar mine and plant at Blue Mountain, Ontario, northeast of Toronto, produces nepheline syenite with a capacity of approximately 100,000 tons per year. The product is a low iron, high alkali, high aluminum material which is an important ingredient in the manufacture of glass.

International also opened a new mica beneficiation plant at Greeneville, Tenn. This is a unique operation, since the raw material is a mica containing silt which has accumulated since 1910 behind one of the TVA dams. The plant cost about one-half million dollars and has a capacity of approximately 64 tons per day.

Lithium Expansion

The lithium industry is rapidly growing in the Piedmont district of North Carolina. In 1951, Foote Mineral Co., began processing ore at a mill near Kings Mountain and Lithium Corp. of America followed in early 1955 with a $7,000,000 processing plant at Bessemer City. A third company, Basic Atomics, is in the pilot-plant stage in Lincoln County.

The Kings Mountain area, 25 miles long and about two miles wide, is believed to contain the largest lithium-bearing spodumene deposits in the United States. Foote Mineral Company's indicated ore reserves are reported to have reached 10,000,000 tons as indicated by sample drilling in 1955. Lithium Corp. of America, is said to have known reserves which will last them for 20 years.

Sintering Plant Begun

Dravo Corp., Pittsburgh, has started construction of the country's largest iron ore sintering plants — one at Gary, Ind., and the other at Saxonburg, Pa. Both of the multi-million-dollar facilities are being built for U. S. Steel Corp.

Initial capacity of each plant will be in excess of 15,000 tons of iron ore sinter per day.

Each plant will contain three machines, with provisions for adding a fourth at a later date. Each sintering machine will be 8 ft 3 in. wide, 200 ft long and about 50 ft high.

The plant at Gary will process iron ore from U. S. Steel's properties in the Mesabi Range of Minnesota. The second plant, near Saxonburg, just north of Pittsburgh, will process iron ore shipped from Mesabi and from U. S. Steel's new mines in Venezuela.

Adds Engineers to Staff

Recent additions to the engineering and supervisory personnel of the Tralee and Harewood plants of Semet-Solvay Division, Allied Chemical & Dye Corp., include the appointment of Charles D. Bowling as mine safety supervisor, Operating Department, Harewood mine, and Jimmy Lee Shumate as engineering trainee, Industrial Engineering Department, Tralee mine.

Lignite Aids Paleontology

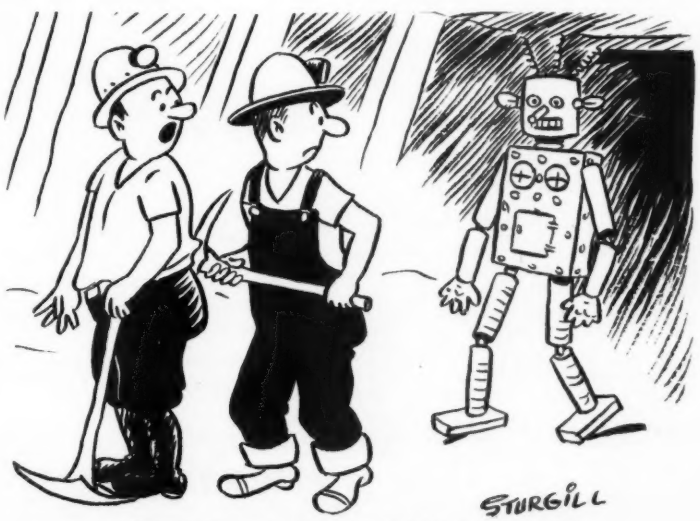
The recently reopened lignite mine at Bacinello, Italy, has produced bone fossils identified as part of a 10,000,000-year-old pre-man, oreopithecus. Paleontologists believe the find may help chart more accurately the evolution of man.

By contrast with oreopithecus, or "mountain ape," the earliest known ancient men are mere newcomers. The Java and Peking men go back no more than 300,000 years.

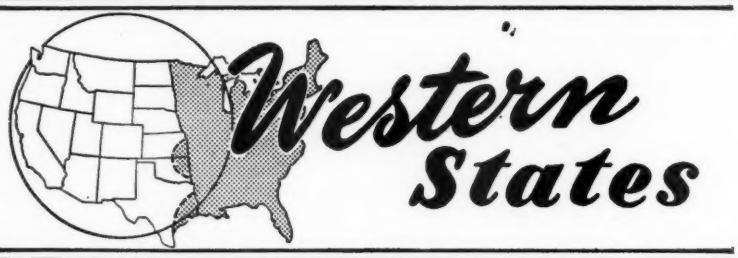
Dr. Helmutt de Terra, of Columbia University, New York, who is heading the search for fossils of the pre-man, said almost daily finds early this summer had provided 30 to 40 pieces of lignite filled with the yellow fossils.

A complete skeleton of oreopithecus was found at the Bacinello mine in 1869, almost a century ago. That was the only such skeleton found. Miners did not know what it was and sent only the skull to Florence. The rest was lost. In a Florence museum, the skull disintegrated to dust and science was left with only a description of it.

"Now, for the first time," Dr. de Terra said, "geologists and paleontologists have seen the fossils taken from the actual site and know exactly the strata they come from."



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Bedrock Uranium Mill

The Atomic Energy Commission and the Atomic Fuel Extraction Corp., Pocatello, Idaho, have signed a contract for the construction and operation by Atomic Fuel of a uranium ore-processing plant at Bedrock, Montrose County, Colo. Construction of the plant is expected to begin promptly, with the completion scheduled in about 10 months. The new mill will process ores from Beaver Mesa, Martin Mesa, Tenderfoot Mesa, and the Bull Canyon area. An acid leach resin-in-pulp circuit will be used to treat the ores. The new mill will process ores from Atomic Fuel properties and also from independent producers in the region. The uranium concentrate will be sold to AEC under the terms of the contract.

Homestake Develops Tungsten

Homestake Mining Co. of South Dakota has signed an option for the development of scheelite properties on Mt. Diablo located about five miles south of Wells, Nev. Paul Montgomery, original locator of the claims, said that Homestake plans to complete a road to the property and to undertake extensive exploratory work during a six-month option.

Antimony Mill Dismantled

Bradley Mining Co. is disposing of its antimony crushing and concentrating plant at Stibnite, Idaho. The smelter, which has been doing some refining work, will be maintained intact while the company continues investigating the possibility of doing further work on foreign or domestic antimony ores. Prior to its shutdown in 1952, the Bradley plant at Stibnite had accounted for 90 percent or more of domestic antimony production.

Mexican Tungsten

Minerals Engineering Co. of Salt Lake City and Grand Junction has signed a five-year contract with Darby and Co., London, to deliver up to 5000 units of tungsten monthly from newly developed Mexican production. This contract amounts to about 40 percent of the anticipated production from the Mexican operation. The Salt Lake Tungsten Co. refinery will receive a portion of this Mexican output when it becomes available the final quarter of 1956. Salt Lake Tungsten is owned jointly by Minerals Engineering and Sylvania Electric Products Corp.

Montana Iron Ore

Preliminary drilling on iron ore properties near Dillon, Mont., indicates reserves estimated at 42,000,000 tons, according to Blair Burwell, president, Montrose Engineering Corp. Metallurgical tests have shown that the ore can be processed to produce premium grade concentrates. The iron deposits are located near Minerals Engineering tungsten properties.

Mercury Joint Venture

Samuel A. Arentz, Salt Lake mining engineer, and Comstock Oil & Uranium Corp., have entered into a joint venture in the development of the Bretz mercury mine in Malheur County, Ore., 12 miles northwest of McDermitt, Nev. Arentz had acquired control of the property through a joint venture with Shawano Development Corp.

Wells Cargo, Inc., Reno, Nev., has been awarded the contract for stripping operations.

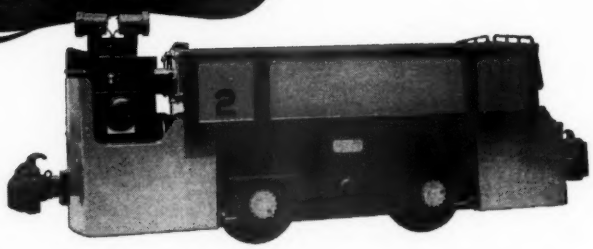
Rifle Uranium Mill

Union Carbide Nuclear Co., a division of Union Carbide & Carbon Co., has signed a contract with the Atomic Energy Commission for a multi-million dollar uranium mill at Rifle, Colo., and "up-grading" uranium ore plants at Green River, Utah, and Slick Rock, Colo.

Union Carbide expects to start work immediately on all three installations. It was reported that a "combination form" of acid treatment of ores will be employed at the new mill. The company expects to have all three facilities in production by the fall of 1957.

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Map Copper Pit by Air

Aerial mapping has recently come to play an important part in the mining of copper at the world's largest open-pit copper mine, the Bingham Canyon mine of Kennecott Copper Corp. at Bingham Canyon, Utah.

Aerial photographs of the huge amphitheatre-like mine now give engineers accurate survey data and completed maps of mine developments within four weeks whereas in the past it took five to six months.

In the past, survey crews spent months moving about the 972 acre hole, locating benches and obtaining data after which several months were required to produce a finished map. By the time the map was completed it was out of date.

Now, a private aerial mapping firm, using aerial cameras and new developments in aerial photographic reading, obtains data from which is prepared a detailed map giving up-to-date information to the engineers as how the development of the mine is progressing and future mining program planned. Aerial surveys are taken every six months.

Aircraft fly the area in a matter of hours, shooting from six to eight overlapping photographs in a series of "runs." When assembled, these photographs form a complete picture of the mine, showing in detail all operational development. Width and elevations of the various mine levels can be established accurately by the use of an ingenious device. This instrument utilizes optical principles to produce a stereoscopic projection. By passing a bead of light over the three dimensional picture, the operator is able to establish variations in elevations throughout the entire pit area based on known elevations of targets previously placed at strategic points in and around the area to be mapped.

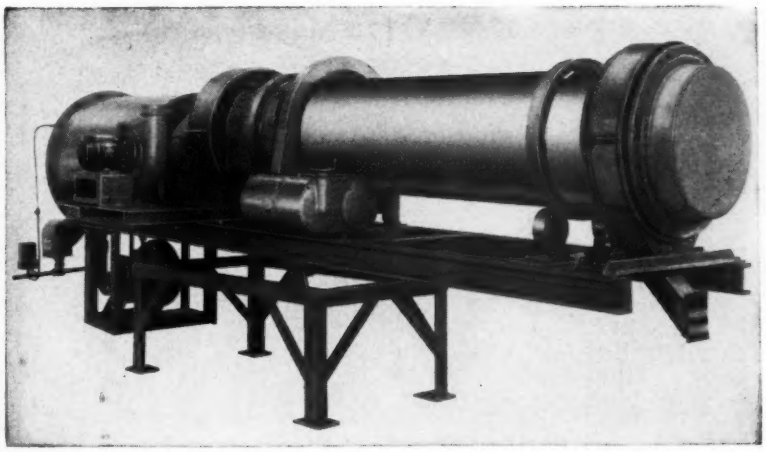
Company officials say the new method of survey has greatly reduced engineering and mapping problems.

Idaho Mine Starts Shaft

American Smelting & Refining Co. has started preparations for sinking the main shaft at its Page mine west of Kellogg from the 3070 to the 3400 level, J. C. Kieffer, northwest general manager, announced recently.

Four compartments of the 55° incline will be extended to the new deep level.

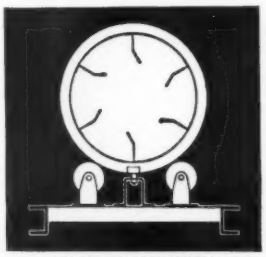
Current production from the Page, the company's biggest operation in this district, is coming from workings on the Tony vein between the 2400 and 2770 levels. Operations between the 3070 and the 2770 levels are largely development work, establishing an intermediate level and driving the necessary raises to prepare the ground for stoping.



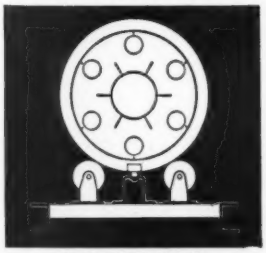
PILOT PLANT ROTARY DRYER

The Ruggles-Coles Pilot Plant Dryer is designed especially for laboratory use or for small capacity unit operations requiring a continuous or intermittent drying step. Each unit:

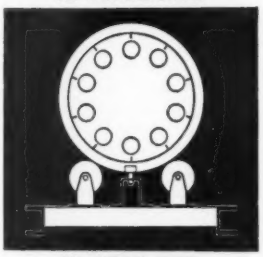
- Is mounted on a structural steel base.
- Has removable "knockers."
- Provides for easy changing of shell rotation speed or shell slope.
- Is available in stainless steel or other corrosion-resistant materials.
- Requires only fuel supply and power connections to be placed in operation.
- Is easily moved from place to place.



XH-XF SINGLE-SHELL



XB DOUBLE-SHELL



XC STEAM TUBE

It is available in three models:

(1) XH-XF single-shell, direct gas fired dryer. Arranged for either parallel or counter-flow operation. Bulletin AH-471.

(2) XB double-shell, indirect-heat, gas-fired dryer for drying without contamination. Volatiles removed with only limited dilution. Bulletin AH-472.

(3) XC steam-tube indirect heat dryer. Can be connected to any available steam supply or furnished with a 3-HP steam generator. Bulletin AH-473.

For complete information write Department 52.

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Los Angeles Mining Show Report

Don't Miss the Event of the Year

UNLESS his lamp has gone completely dead, there isn't a mining man in the country who should feel that he can afford to pass up the year's premier mining meeting—the 1956 Metal Mining and Industrial Minerals Convention and Exposition of the American Mining Congress at Los Angeles, October 1-4.

The Program Committee has assembled a splendid array of speakers, on subjects that will be of tangible value to everyone connected with the extraction and processing of minerals —from chairman of the board to up-and-coming production workers. There will be sessions dealing with general and economic problems of the industry, as well as "bread-and-butter" sessions filled with information to help operators cut costs and streamline their methods.

Prominent mining men, Government officials, and others connected with the national scene will participate in the four-day Convention, with addresses at the various sessions dealing with National Mineral Policies, Labor and Management Relations, Industrial Minerals, The State of the Metal Mining Industries, Public Lands, Taxation, Health and Safety, Gold, Silver and Monetary Policies, Strategic Minerals and Uranium and its problems.

The highlights of recent developments and future plans in the practical operation of mines and processing plants will be featured at a dozen sessions covering open-pit mining and quarrying, underground mining, exploration and geology, milling and metallurgy, and processing of industrial minerals. There will be papers from all sections of the country, representing the many branches of the mining industry. The largest as well as the smallest producers will take part. From more than a thousand suggested subjects and speakers the Program Committee selected varied and well-balanced material of interest to all sections of the industry. Some papers will be the result of concentrated technical study while others are of broader scope, describing the principles and coordination that go into a good mining organization.

The program has been planned so that it will be snappy and to-the-point, allowing ample time to study the exhibits filling three floors of the Shrine Exposition Hall and a large area outside. The largest showing of machinery, equipment, and supplies for the mining and processing of metals and industrial minerals ever held, the Exposition will be open from 9 A. M. to 5 P. M. for four days, Monday, October 1, through Thursday, October 4. Time is provided for all convention-goers to examine each manufacturer's contribution to efficient operation—and you'll want to spend every minute you can catching up on the latest advances by the progressive companies displaying their products.

Plans are also practically complete for the gala entertainment awaiting you in connection with the 1956 Mining Show, and all in all, you just won't want to miss anything that's planned to make your Convention-Exposition trip this year the most memorable one ever!

The two highlights of the social program are the Miners Jamboree and the Annual Banquet, on Tuesday and Thursday nights. Be sure to bring your wife to help you enjoy these festive events.

The ladies, as in other years, will also have a full series of day-time events with luncheons, style show, a tour of Beverly Hills, Bel Air, Will Rogers State Park, and the beaches, and time left over to "do the town." Their interest in the mining industry will lead many of them to the exhibit

halls to see the latest "tools of the trade."

Four special events are scheduled for Friday, October 5, three of which are all-day tours of mining and mineral processing operations covering a wide range of interests. The fourth event is a visit to delightful Disneyland, which should prove particularly attractive to ladies who don't wish to spend the day accompanying their husbands on one of the "workaday" tours.

First stop on the Crestmore-Fontana-Irwindale tour will be the Riverside Cement Co. operations at Crestmore, which include a surface plant and underground mining by a new room-and-pillar method employing the latest equipment. Following luncheon at Riverside, the party will visit the Kaiser Steel plant at Fontana, where the raw materials handling will be of particular interest. The final stop will be at the Irwindale plant of Consolidated Rock Products Co. at Azusa, where material for concrete aggregate and other building purposes is surface-mined and processed.

Another tour will first take in the Watson Refinery, near Long Beach, of Richfield Oil Co., a 130,000 bbl per day refinery which includes a large fluid catalytic cracking unit. The party will lunch at Portuguese Bend Club on a 7000-acre development of Great Lakes Carbon Corp. and will later see that company's mining and processing of diatomaceous earth. Other points of interest will be Marineland of the Pacific and San Pedro Hill, which towers 1480 ft over the industrial-harbor area of Los Angeles.

A third tour will visit the Boron operations of Pacific Coast Borax Co., including an underground borax mine using continuous miners and shuttle cars and a magnetic separation plant, together with the new open-pit development which is attracting wide attention.

The Disneyland tour will appeal to men as much as to the ladies, for this famous park is a fair, a city from Arabian Nights, and a metropolis of the future all in one.

The AMC Housing Bureau, c/o Los Angeles Chamber of Commerce, 1151 S. Broadway, Los Angeles 15, California, is still accepting requests for hotel reservations. If you haven't already arranged for accommodations, mail your application today.



Equipment Exhibition—a mining education in itself

Tintic Group Accepts Exploration Contract

Shareholders of Tintic Standard Mining Co. and other Tintic Group companies have ratified a contract with Bear Creek Mining Co., Kennecott exploration subsidiary, covering a multi-million dollar search for minerals in Utah's Tintic district.

The exploration program, including a 1000-ft multiple compartment shaft and extensive core and percussion drilling, will get under way immediately.

The Tintic Group includes Tintic Standard Mining Co., Eureka Standard Consolidated Mining Co. and South Standard Mining Co. Chief Consolidated Mining Co., the other major partner to the venture, has approved the pact.

Sapphire Deposit in Montana

The rich Yogo sapphire deposit in Judith Basin County, about 60 miles northwest of Billings, Mont., unworked for 30 years, has been acquired by Rocky Mountain area investors from its British owners and will go back into production soon.

A six-year campaign to acquire the stock of the New Mine Sapphire Syndicate, which owned the property, ended in success in July when the stock was formally transferred to Thomas P. Sidwell, Billings, Mont., investment man, through the Denver National Bank.

Sidwell and Commercial Uranium Mines, Denver corporation headed by Martin Legere, jointly bought up about 145,000 of the 150,000 shares in the British syndicate.

The deposit is described by the U. S. Geological Survey as "the most important gem locality in the United States" and bearing sapphires of highest quality. The Yogo is believed the world's only known sapphire lode in a dike some four miles long.

The British syndicate stopped working its claims because of currency difficulties involving the pound sterling and double taxation by the U. S. and Great Britain, Sidwell and Legere said.

Idaho Scholarships

Trustees of the Hecla-Bunker Hill scholarships fund have announced the granting of $5800 in scholarships. Twenty-four University of Idaho students and one student at Northwest Nazarene College, Nampa, Idaho, will share in the awards made annually from a $100,000 fund established by Hecla and Bunker Hill in 1951.

Scholarship winners include Robert Sewell, Spokane; Bernard Henderson, Clark Fork; Marlin Briggs, Harold Mason and Barbara Monteith, Cataldo; William Higgins and Donald Hull, Osburn; Carole Beck, Curtis Bondurant and Clara Lowry, Wallace; Bernard Rash, Sandpoint; David Damiano, Glen McCurdy, Felix Marcolin, Richard Miles, Virginia Rafferty, Noreta Smith, Roland Williams and Leslie Killingsworth, Kellogg.

Phosphate Firm Plans Expansion

Western Phosphates, Inc., a joint affiliate of Stauffer Chemical Co. and Garfield Chemical & Manufacturing Co. (American Smelting & Refining Co. and Kennecott Copper Corp.) has outlined a multi-million dollar plant expansion program.

The projects, some of which are now in process of completion, will add important elements of diversification both to operations and products of the agricultural fertilizer facility near Garfield, Utah.

Cost of this latest expansion is placed at around $2,000,000.

The most important general feature of the current developments at Western Phosphates is the addition of nitrates to a line of phosphatic fertilizer products. Thus the Utah production unit will be in position to turn out high strength fertilizers containing two of the three essentials for plant growth—phosphorus and nitrogen.

The third essential, potash (potassium), will be rolling out in blends with phosphates and nitrates within two years, according to Elwood I. Lentz, vice-president and general manager.

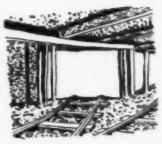
At present the 150 employes are concentrating on increasing the output of ammonium phosphates from about 10,000 to 70,000 tons annually.

Lentz said that three principal forms of dry ammonium phosphates are now or will be turned out in in-

THE
OUTSTANDING
MINE VENTILATION
LINE

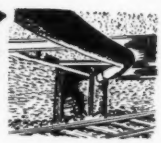
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✓ FOR DEPENDABILITY
✓ FOR COMPLETENESS

ABC BRATTICE CLOTH



7 types to fit all needs —3 types of jute cloth, 2 types of cotton, plastic and Black Ace for nongaseous mines. Carefully processed to resist flame, except Black Ace, and to resist mildew. In widths and lengths for any seam.

MineVent



FLEXIBLE VENTILATION TUBING

Made in two grades: jute base and cotton base, synthetic rubber coated. Resists leakage, abrasion and moisture. Available in 9 diameters, 8" to 36" and 25, 50 or 100 ft. lengths. Choice of 3 types of suspension, demountable patented Snap-On coupling or Sewed-In coupling. Most widely used mine ventilation tubing.

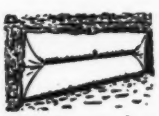
NEOLON FLEXIBLE VENTILATION TUBING

The new Neoprene coated Nylon fabric tubing. Almost impossible to tear. Airtight. Resistant to abrasion, acid mine water and flexing. Same lengths and diameters as MineVent.

NON-COLLAPSIBLE TUBING

Both MineVent and Neolon are available with telescoping spring wire inserts rendering the tubing non-collapsible. Light weight. Economical.

ABC INFLATABLE BRATTICE



Sizes to fit any opening. Readily fills rough contours, jagged walls, etc. Quickly inflated by special hand pump. Quickly deflated to move to new location. Easy to transport. Economical to use.

ABC POWDER BAGS



Rubber coated durable fabric, firmly sewed, for long use and hard wear. 5 sizes: 20, 30, 60, 125 and 160 sticks of explosive. Send for Catalog 55.

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BRATTICE CLOTH CORP.
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MAIN OFFICE: 310 S. Buffalo St.

creasing volume at the plant. These include mono-ammonium phosphates, with mixing ratio of 11-48-0; diammonium phosphate produced by wet or sulphuric acid process with mixing rates of 18-48-0, and a "homogeneous" product, containing ammonium nitrate and mono-ammonium phosphate, 27-14-0.

Before the first of next year, Western Phosphates will have completed facilities for production of a liquid-type, high strength nitrogen-phosphate fertilizer.

Another product which has been added to the line is an ammonium phosphate containing gypsum (calcium sulphate) essential to many of the alkaline soils of the West. It is known as 16-20-0.

New Kennecott Smelter

The contract for construction of a new smelter for the Ray Mines Division, Kennecott Copper Corp., Hayden, Ariz., has been awarded to Western Knapp Engineering Co. of San Francisco. The project is part of a $40,000,000 expansion program announced by Kennecott earlier this year, which is to extend the life and reduce production costs of its Ray Mines Division.

The over-all expansion is expected to increase the Division's annual copper production by 20,000 tons by 1958. In 1955 it produced about 50,000 tons of copper. The present mining limits of the pit will be extended so adjacent and deeper sections of the ore body may be mined. Additional mining and milling equipment will also be installed for the production increase.

New Bunker Hill Policies

Bunker Hill Co. has announced changes in internal policies in a move to divest itself of non-mining activities. New policies include the proposed sale of the Lighthouse electric distribution system in Kellogg to the Washington Water Power Co. and the reorganization of company housing.

John D. Bradley, president, also announced that the company is establishing a profit-sharing plan for all salaried employes, to be supported solely by contributions from company profits. When formally approved by the Internal Revenue Service, the plan will become retroactive to January 1, 1956.

At the same time, Bradley announced, metal processing facilities are being expanded and the search for new ore deposits is being broadened. The company is focusing its exploration activities in the Northwest area, he said, including Canada and Alaska, and is concentrating on lead and zinc in the interest of keeping its smelting and refining "pipelines" filled.

Wyoming Uranium Mine Sold

An official of Continental Uranium, Inc., has announced that his firm has agreed to buy the Gaddis Mining Company's Crook Gap uranium mine in central Wyoming for $3,250,000.

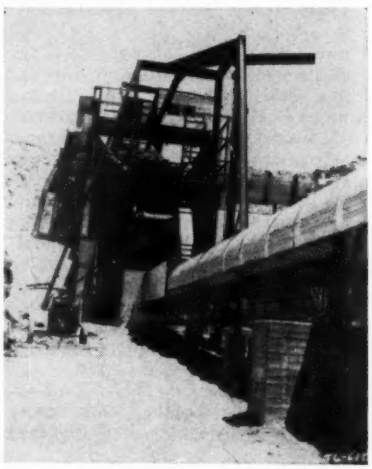
Robert Pruess, general manager and director of Continental with offices in Grand Junction, Colo., and in Chicago, said payment of the sale price will be staggered each year until 1962.

Phelps Dodge—Uranium

Stockholders of Wyoming Uranium Corp. have approved a lease-option agreement signed by directors of the firm with Phelps Dodge Corp., which calls for exploration and development of uranium properties at Crooks Gap, Fremont County, Wyo. Phelps Dodge is now making arrangements to establish a camp site and to move exploration equipment onto the properties.

Big Jaw Crushes Uranium Ore

Said to be America's biggest overhead eccentric jaw crusher, a Pioneer 42 by 48 in. has been set up at an open pit uranium mine near Laguna, N. M. The big crusher is reducing uranium ore for The Anaconda Co. prior to shipment from its Jackpile open pit mine to a concentrating plant



near Bluewater, N. M. The crusher is powered by a 200-hp diesel engine.

A feature of unusual interest is the protection of the crusher housing, the feeder trap area, and the 425-ft conveyor belt from prevailing winds which would blow precious uranium dust away in quantities which could be of economic concern. A fully enclosed rolled half-round protective shed has been built over the conveyor delivery line, and construction is under way to enclose the jaw crusher and feeder trap areas completely. That will preserve most of the uranium dust. Also, as a concession to wind erosion, the railroad cars are not being filled to their full capacity.

Wyoming U-Ore Deal

Lisbon Uranium Corp. has completed an operating agreement involving sharing of any net profits from mining, with Fuesner & Sons, Basin, Wyo., covering uranium production in Little Mountain, Big Horn Range, Wyo.

A. P. Kibbe, Salt Lake City, Lison president, said Lisbon would match an original investment already made by Roy H. Wayne and Roy D. Fuesner, Basin dairy operators, and that this investment would get "heavier" depending on what develops in mining. Covered are some 41 unpatented mining claims.

Lisbon's principal properties are in Utah's Big Indian District.

Hecla Searches for Ore

Hecla Mining Co. will start underground exploration of the Princeton Mining Company's 32-claim property east of Mullan, Idaho. However, work for the present will be limited to the driving of a 250-ft tunnel. The work will be done under a newly approved amendment to an operating agreement signed late in 1953. Hecla and Bunker Hill Co. will acquire a 60 percent interest in the property after expending $600,000 on exploration and development or when commercial ore is found.

Happy Jack Mine Purchased

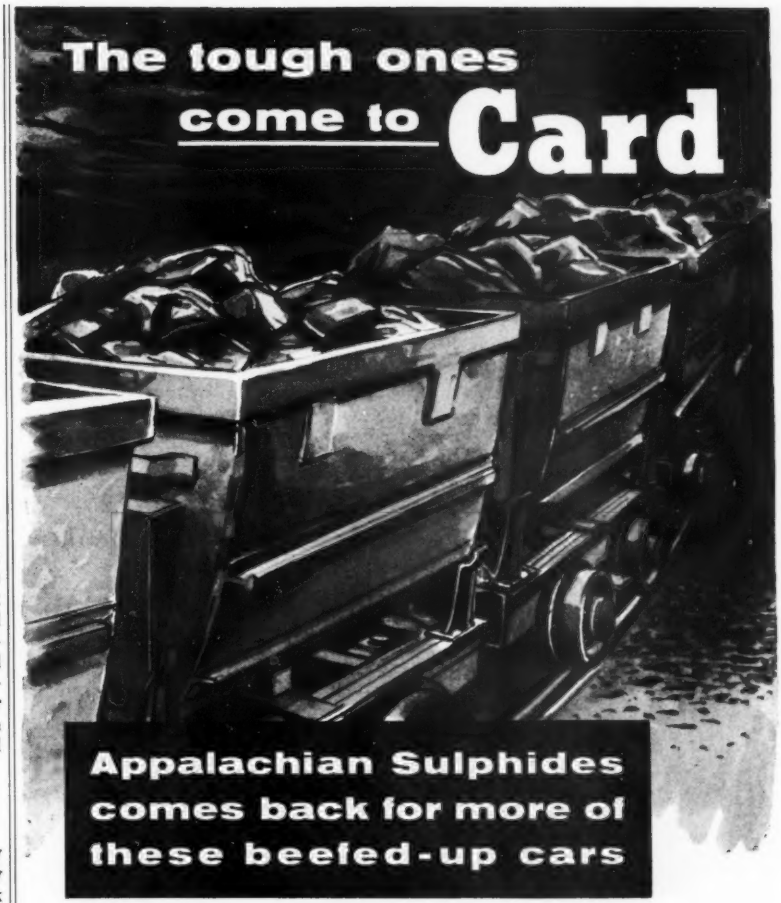
The Texas Co. and the New Jersey Zinc Co. recently announced that they jointly had purchased the Happy Jack Mine in Utah from the Bronson and Copper Mining Co. of Monticello, Utah. Substantial tonnages of uranium ore have already been blocked out in this mine.

Purchase was made through the Texas Zinc Minerals Corp., jointly owned by the Texas Co. and the New Jersey Zinc Co.

The companies also announced that a contract has been signed with the U. S. Atomic Energy Commission for the construction and operation of a uranium processing mill to be built by the Texas Zinc Minerals Corp. at Mexican Hat, Utah, near the San Juan River on land leased from the Navajo Indian tribe. Under the contract, the uranium concentrate produced at the mill will be sold to the Atomic Energy Commission on a per unit price basis.

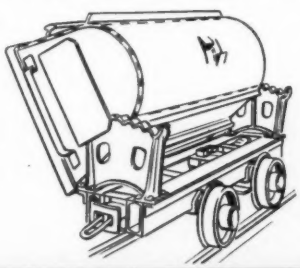
The mill will be about 70 road miles from the Happy Jack Mine. Capacity of the mill at Mexican Hat was not disclosed.

Construction of the processing mill at Mexican Hat has already begun, and is scheduled to be completed in September 1957. Texas Zinc Minerals has been licensed by the Atomic Energy Commission as a buyer of uranium ore from other sources.



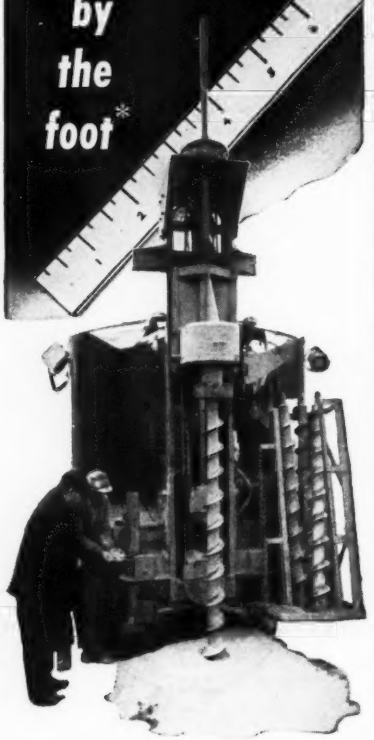
Within a five year period Appalachian Sulphides, Inc., (formerly Vermont Copper Co.) has purchased 42 Card Rocker Dump Cars on four successive orders. The heavy sulfide ore is side-loaded by rocker-shovel, placing unusual strain on the cars. Card engineers worked closely with the customer to produce a 40 cubic foot car which does not break down under this service.

The result is a car body of low-alloy high-strength steel plate, mine rail reinforced, and a frame nearly three times standard strength with proportionately heavy rocker pedestals. It includes the new Card safety locks. Our engineers are always willing to work with you for the right solution to some particular haulage problem. Standardize your haulage with an economical Card design.



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**Strip Miner Drills 8-1/2" Blast Holes 60 Ft. Deep in 1 Hour, Including Moving Time.*

Savings, like costs, are measured by the foot, especially in tough earth and rock formations. Using the new McCarthy 106-24 Vertical Drill, this Pennsylvania strip miner cut drilling time to 1 hr. per hole (including moving time) on 60-ft. blast holes 8½" in diameter. Formation was 20 ft. of soft top strata, 35 ft. sandstone and 5 ft. of hard sandstone and bastard limestone.

A new speed reducer on Model 106-24 slows auger rotation for drilling harder rock formations. The result is more torque, or "biting power." You have fewer bit failures, cutting over-all drilling time. Driller above used tungsten carbide bits.

The McCarthy Model 106-24—"World's Fastest Heavy-Duty Vertical Auger Drill"—handles augers from 3" to 24" in diameter.

Write for Bulletin M-100

THE SALEM TOOL CO.
779 S. ELLSWORTH AVE.
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New Aluminum Plant

Harvey Aluminum of Torrance, Calif., has announced that all financial and contractual arrangements have been finalized for construction of the company's 54,000-ton aluminum reduction plant at The Dalles, Ore.

Work at the 500-acre site at The Dalles, interrupted four years ago, was resumed in August. The plant is scheduled for completion late in 1957. The announcement confirmed earlier reports that Harvey Machine Co., Inc., of which Harvey Aluminum is a division, has borrowed $44,000,000 for the project from the Bank of America, Chase Manhattan Bank, and First National City Bank of New York.

The loan includes provisions for additional working capital of up to $10,000,000, and after completion of the reduction plant for additional capital funds under certain terms and conditions for up to $25,000,000. The term of the loan is ten years.

Mr. Lawrence A. Harvey, executive vice-president of Harvey Machine Co., Inc., stated: "We are constructing this plant entirely with private funds. The banks involved are the three largest banking institutions in the United States. They have demonstrated complete confidence in us and in the future of an expanding aluminum industry."

Power for the reduction plant will be purchased from Bonneville Power Administration on a long-term contract. Under an agreement with the Department of the Interior, Harvey will put up more than $2,000,000 for transmission facilities to bring power to the aluminum plant from Bonneville's Big Eddy Switching Station.

Harvey also announced details of an interim five-year agreement for alumina with Nippon Light Metal Co., Ltd., and Sumitomo Chemical Co., Ltd., large producers of alumina in Japan. The two companies will sell more than 100,000 tons of alumina a year to Harvey.

The Japanese alumina will be loaded on special ore cargo ships at Niihama and Shimizu, cross the Pacific, sail up the Columbia River, and be unloaded at Harvey's docks at The Dalles. Congress has authorized a navigable depth of 27 ft for the Columbia River through the Bonneville Locks to The Dalles. Northwest mining and agriculture interests have indicated a desire to use the east-bound ship cargo facilities.

The reduction mill will be smokeless and fumeless and, according to the company, improves upon all primary aluminum mills now in existence.

Electrolytic cells will be built in Harvey's Torrance plant and all aluminum bus work will also be produced in the California plant. Electrical rectifiers and substation equipment were ordered from Westinghouse Electric Corp.

Structural steel towers for the mill are being manufactured in the Bethlehem Pacific Seattle Works. Pacific Iron & Steel Corp. will construct the buildings.

Fabrication facilities will be built in connection with the reduction plant. The entire facility will give employment to more than 500 people and provide impetus for increased general business activity in The Dalles.

Utah Potash Fusion Facility

Bonneville Ltd., Wendover, Utah, potash producer, has a $175,000 fusion plant under construction near its solar evaporation facility, according to Lockwood W. Ferris, vice-president and general manager.

The fusion unit will "granulate" potash to specifications of customers. It is likened to a kiln which melts down the potash and reforms it to desired sizes. The fusion plant will be fired by burner oil.

At present the plant produces the agricultural fertilizer in sizes separable through 230 mesh. But it is now the trend in the potassium trade to provide larger sized granular material, Ferris said.

Utah Construction Co. is building the facility which is scheduled for completion in October.

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▶ELECTROMAGNETIC UNITS
▶SELF POTENTIAL AND
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Self-Potential & Resistivity Unit

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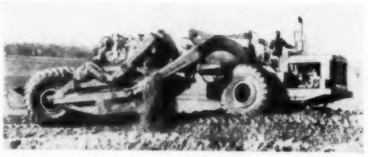
GEOPHYSICAL
Instrument & Supply Co.
1201 Broadway Denver, Colo.

Manufacturers Forum

Motor Scraper

A 200-HP, TS-260 Motor Scraper has been introduced by Allis-Chalmers Manufacturing Co., Milwaukee, Wis.

The 14-cu yd heaped capacity scraper has a curved bottom and three-piece cutting edge with offset center edge.



Positive forward ejection plus high apron lift is said to provide fast clean spreading.

Other features designed into the scraper are selective hydraulic steering, synchronized four-wheel air brakes, an emergency brake system which goes into action in the event of air line failure and an all-steel welded box-type frame for rigid support and maximum true alignment of the power train. The engine can be removed without removing the transmission, and the clutch can be removed without removing the engine.

Radiophone

A MOBILE TWO-WAY RADIO rated at 100-w transmitter power output on any channel in the 25 to 54 megacycle frequency band is the latest addition to Motorola's line of



Twin-V radiophones. It incorporates dynamotor-vibrator power supply which, at a power intake equivalent to conventional 60-w mobile radios, provides full rated transmitter output.

The transmitter is capable of up to four-channel operation with each frequency crystal-controlled. The radio set operates interchangeably between 6 and 12-v vehicles without adapters or modifications. Models are available for both standard and split channel operation.

More information is available from Motorola Communications & Electronics Inc., 4501 W. Augusta Blvd., Chicago 51, Ill.

Inquiries about new equipment appearing in Manufacturers Forum are welcomed. For additional information on any piece of equipment in this section write directly to the manufacturer, or to Mining Congress Journal with name of item and date of issue in which it appeared.

Tires

TUBELESS TIRES are being offered as standard equipment for many wheel-type earthmoving machines manufactured by Caterpillar Tractor Co., Peoria, Ill. In addition to reducing the mounting problems inherent in tube-type tires, tubeless design reportedly offers the customer several other advantages such as no tube pinching, cooler running, easier repair, and elimination of tube and flap inventory. Wide base tubeless tires are offered in standard tread patterns.

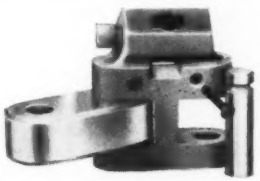
Lift Truck

THE GASOLINE POWERED Hyster Co. Lift Truck series of 3000, 4000 and 5000-lb capacity models on pneumatic tires reflects current automotive trends typified by compact, close to the ground silhouette, increased safety, automobile-like controls, greater operator comfort and faster speed of operation. The load lifting speed is 48 fpm for the Hyster 50 and 50 fpm for the Hyster 30 and 40. Forward travel speed is 13.8 mph for all models.

For further information write Hyster Co., 2902 N. E. Clackamas Street, Portland 8, Ore.

Trimmer Chain

STRENGTH AND FLEXIBILITY are claimed for Bowdil's new Trimmer Chain. For all makes of continuous boring machines, the chain uses Bow-



dil throw-away or ½ by 1 in. shank bits. Chains may readily be assembled or disassembled with the use of small hand tools and the chain pitch may be varied by changing couplers only.

Write to The Bowdil Co., Canton 7, Ohio.

Splicing Conveyor Belts

FLEXCO POWER TOOLS for splicing conveyor belts consist of a boring bit and an alloy steel wrench that have been designed for use in standard electric or air impact tools.



New templets eliminate the inconvenience of inserting fasteners from the pulley side of belts.

For additional information write to the Flexible Steel Lacing Co., 4675 Lexington St., Chicago.

Drill Modification

FASTER AND STRONGER ROTATION, resulting in increased drilling speeds and hole footage, has been achieved in the 45-lb Le Roi-Cleveland H-10 sinker drill, according to the manufacturer. The Le Roi Division, Westinghouse Air Brake Co., Milwaukee, Wis., announced the modification and its adaptation to former

manufactured models of its H-10 drill.

The changes incorporate the use of a new valve. By increasing the metering limits of the valve and the valve block, fast drilling speeds are possible in both hard and soft formations due to the extremely short travel of the valve. The new valve and valve block are interchangeable with those previously used in the H-10 sinker drill.

Plant Addition

WILMOT ENGINEERING CO., White Haven, Pa., builders and equippers of coal preparation plants, has started construction of a plant addition to its White Haven, Pa., plant. A new heavy plate shop is nearing completion and a new engineering building is planned that will more than double that department's facilities. The company is also establishing a sales organization which will encompass direct representation in national and foreign markets.

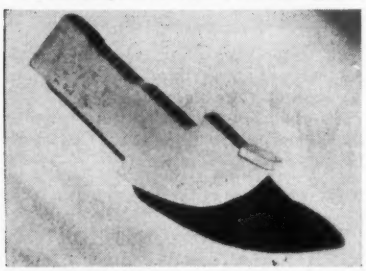
Spectacles

THE PLASTIC, Smooth-Hook Temple, a further development of the patented Retrax Temple for Eye Savers Tuc-Away and Visor-Tuc Safety Spectacles, has been announced by the Watchemoket Optical Co., Inc., 232 West Exchange St., Providence, R. I. The hooks rotate continuously through 360° and telescope in and out to enable perfect fit by the wearer without the use of tools. The temple hooks are made of plastic. They rest comfortably and snugly against the head and retain their position through substantial friction produced by the close fit of the plastic hook into the plastic temple. They have the same flexible hinges as the regular retrax temples to enable the wearer to angle the lenses for snug fit at the cheek.

Mining Bits

CALLED THE "J" STYLE continuous miner, this new bit can be used for all types of coal seams, according to Carmet, the cemented carbide producing facilities of Allegheny Ludlum Steel Corp.

A harder, more wear resistant grade

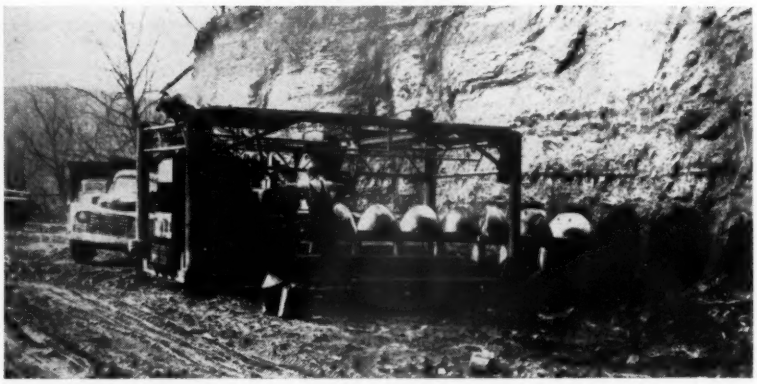


of carbide has been added to the tip of the tool which incorporates the forged hook angle at the top of the tool to aid in removing the bit from the continuous mining machine, and has a forged-in set screw notch which helps prevent lost bits. The tip design provides for a full radius on the cutting nose, which is said to increase the strength on the cutting edge for applications in rough cutting conditions.

Another mining bit is the "CC" style milled shank tool. This was designed for use in light to moderate under-cutting machines and continuous miners. One of the advantages of this tool is the chisel nose design which is claimed to be more free cutting than radius nose tools.

Request additional data from Public Relations Dept., Allegheny Ludlum Steel Corp., Room 2036, Henry W. Oliver Bldg., Pittsburgh 22, Pa.

Auger Miner



CAPABLE OF DRILLING OUT 700 TONS of coal daily from 50-in. holes with a three-man crew, the Cardox Auger Miner Model 235 is now in use at strip mines where excessive overburden makes further conventional stripping unprofitable.

The unit is self-positioning vertically and self-moving horizontally from hole to hole by means of three sliding shoes. In operation the machine spans the space of two holes. After the first hole has been drilled out for a distance up to 200 ft or more, the 12-ft auger lengths are retrieved one at a time. The completed hole then serves as storage for the augers and lessens the over-all time needed to retract and connect augers to be used to drill the next hole.

Despite its large size the Cardox Auger Miner is said to work easily in a 26-ft pit or shelf.

Request additional information from Cardox Corp., 307 N. Michigan, Chicago 1, Ill.

Camera

LAYOUTS, lettering, artwork, scalings, "swipe files," perspectives, mechanicals, cutting silk screen stencils to size on the viewing area and proportion work are some of the functions of the Camera Lucikon Model B. Any opaque subject matter may be enlarged or reduced 400 percent in true color and projected through and upon tracing paper or one-ply paper for tracing or visual inspection purposes. A vinyl hood allows the operator to use this unit in a well-lit room without resorting to a darkroom. Either ac or dc 110-v current may be used. A four element, color corrected f4.5-32 Wollensak lens is also included.

For more information write to The M. P. Goodkin Co., 889 Broad St., Newark 2, N. J.

Magnetometer

SUITABLE FOR MANY PROBLEMS in mineral exploration, such as mapping contracts, faults, etc., for location of magnetite and pyrrhotite and for petroleum exploration, the Sharpe A-2 Vertical Force Magnetometer is being distributed in this country by Geophysical Instrument & Supply Co., 1201 Broadway, Denver 3, Colo. The unit is described as a one-man instrument which does not require any assistant field operator because an orienting compass is permanently mounted on the instrument. Total weight, including tripod, is 13 lb. A sensitivity as fine as 10 Gammas per scale division is reported.



Conveyor Roll Bearings

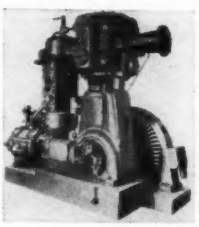
A LINE OF BALL BEARINGS specifically for belt conveyor rolls is produced by the Marlin-Rockwell Corp. According to the manufacturer, its long experience in the conveyor field has led to development of design for both inboard and outboard mountings utilizing various types of seals,

in synthetic rubber and cork-felt combinations, to hold grease in and keep dirt out.

Request Form 1529-1 from Marlin-Rockwell Corp., Jamestown, N. Y.

Compressor

COINCIDENT with the recent establishment of a specialized compressor sales-and-service division within its staff, Atlas Copco Pacific Inc., has broadened its line to include the full range of Atlas Copco series AR compressors.



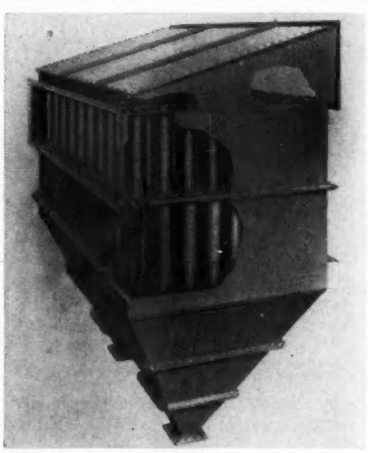
The heavy duty AR series is said to be especially designed for permanent mining operations. It includes six models, ranging in size from 330 to 3220 cfm—all are of the L-shaped, two-stage, double acting type compressor, fully counterbalanced.

Smaller units in the series are available skid-mounted, requiring no concrete foundation and permitting the compressor plant to be moved to different sites as work progresses.

Illustrated literature on AR compressors is available from Atlas Copco Pacific Inc., 930 Brittan Ave., San Carlos, Calif.

Multiple Tube Collector

A MECHANICAL COLLECTOR of the multiple tube type incorporates new design principles to increase the gas handling capacity, according to Research-Cottrell, Inc., Bound Brook, N. J. Designated the Cyclo-Trell, the new design reportedly has a higher collection efficiency and a greater gas flow for a given pressure drop than has previously been obtainable in conventional multiple tube collectors. The collector consists of a series of cyclone tubes arranged in parallel, and depends on centrifugal force for its operation.



Jaw Crusher

WITH FORCE-FEED ACTION and long jaw design, these overhead eccentric type McLanahan Jawmaster Crushers are produced in 13 sizes, ranging from 10 x 16 in. to 40 x 48 in., and with capacities up to 750 tph. Roller bearing construction throughout and an extra heavy welded-steel frame are claimed.

Copies of the bulletin on the McLanahan Jawmaster Crushers may be obtained from McLanahan and Stone Corp., Hollidaysburg, Pa.

Electric Hammers

A LIGHTWEIGHT, electric hammer for maintenance and construction work, the H54U Electric Power Hammer weighs 12 lb 13 oz and will drill holes in concrete to 1⅛ in. in diameter. The tool delivers up to 1900 blows per minute. Operations may be performed on a variety of materials including concrete, macadam, stone, cinder blocks, wood, metal, tile and earth.



For further information write the Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y. and request Form 5199.

Slurry Density Control

UTILIZING GAMMA RADIATION to measure and control the density and hence the percent solids of ore slurries and pulps, the Density Gammagage is said to offer a solution to many of the major problems in automatic control of milling operations. The instrument combines high sensitivity with completely non-contacting operation.

For additional data write to Isotope Products (Instrument Division) Inc., 1700 Niagara St., Buffalo 7, N. Y.

Extended Line for Movall

MOVALL-ROCK WAGONS are now available for all rubber-tired tractors and many crawler-mounted prime movers, according to the C & D Division, Yuba Manufacturing Co.

Movall capacities range from 12 to 26½ cu yd struck, with load ratings from 22 to 45 tons. Interchangeable goosenecks enable users to switch prime mover from scraper to Movall or vice versa. The Movall has a dozer-type positive ejection that works like a scraper in reverse. Its 140,000 lb push reportedly wipes the body clean of any material that can be top loaded —rock, dirt, mud or sticky clay.

Self-Propelled Scraper

WITH HEAPED CAPACITY OF 26 cu yd, the Cobra Quad is said by its manufacturer to be the highest capacity three-axle type self-propelled scraper available today. Woolridge Manufacturing Division, Continental Copper & Steel Industries, Inc., Sunnyvale, Calif., makes the unit.

Comprised of a 300-hp diesel four-wheel tractor with a two-wheel scraper attached through a universal ball and socket yoke connection, the unit has fluid coupling drive; air actuation of clutch, transmission, and winch; hydraulic steering; low profile bowl design; rear fulcrum application of power to the cutting edge; and the Woolridge "boiling bowl" loading principle.

Financial Assistance

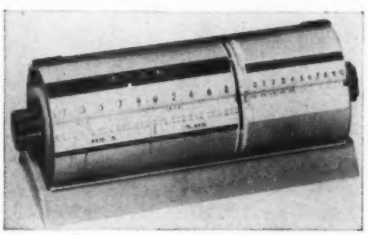
FORMATION OF Allis-Chalmers Credit Corp., a wholly-owned subsidiary of the Allis-Chalmers Mfg. Co., has been announced. Purpose of this new company is to assist in financing sales of Allis-Chalmers machinery. Initially, this will apply to machinery of the firm's Tractor Group.

Company officials said that financing offered by Allis-Chalmers Credit Corp. is intended to supplement sources of bank and other credit now available.

Tax Computer

A DRUM-TYPE payroll tax computer for fast, accurate calculations of F.I.C.A. and Federal Withholding Tax deductions—shown all on one reading line—has been perfected.

The Ayres Calculer-D figures Federal payroll tax deductions for any pay period, wage payment and number of dependents. Should Federal tax rates be changed, the computer is designed so new drum-charts may be quickly affixed.



Further information may be obtained from the Ayres Corp., Box 1081, Wilmington, Calif.

Truck

CHOICE OF QUARRY OR STANDARD bodies and two transmissions to fit job conditions are available with



the 24-ton International Model 95 Payhauler, recently introduced by the Construction Equipment Division of International Harvester Co. With four-speed constant mesh transmission allows a top speed of 37.2 mph.

Reader

THE FILM-A-RECORD Electronic AO Reader is designed to accommodate either 16 or 35 mm microfilm. Electronically operated, it has fingertip control from high speed to slow creep and stop. Manufactured by the American Optical Co., the AO Reader has a 14½-in. square screen and built-in interchangeable lenses that permit an instant switch from 23 to 1 to 40 to 1 magnification.

Request information from Remington Rand, a division of Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y.

Signal Horn

POWERED BY CARBON DIOXIDE, this portable self-powered signal horn can be heard more than half a mile over such places as construction sites, railroad right-of-ways and open pit mining properties, according to the Falcon Alarm Co., Inc., Summit, N. J.



Trade-named the Falcon Big Bertha, it will produce approximately 250 five-second blasts before requiring recharging with compressed CO_2. It also can be adapted to operate on different types of gases.

The standard model of the 40-lb Big Bertha consists of a 15-lb steel cylinder of CO_2, 13-in.-long horn, special diaphragm and valve assemblies and a pressure gauge. Over-all height is 31 in.

Portable Bender

A BENDER that bends tubes, pipes, reinforcing rods, and flat bars is being manufactured by J. B. Sebrell Corp., 300 So. Los Angeles St., Los Angeles 13, Calif. The manufacturer reports that the unit bends steel flat bars up to 2½ by ½ in.; round and rectangular steel and reinforcing steel bars up to and including one in.; steel pipe from ¼ in. to and including 1¼ in.; and steel, aluminum, and copper tubing up to and including 1⅝ in.

There are three models available. Prices range from $195 up to $522.12, f.o.b. Los Angeles.

Time Delay Valve

A LINE OF TWO-WAY, three-way and four-way time delay valves has been announced by Airmatic Valves, Inc. The time delay valve provides delayed actuation with immediate reversal or immediate actuation and delayed reversal. Working on a volume principle, operating time of from zero to five minutes delay may be accomplished by manual pre-set adjustment. Being pilot operated, these valves may be remotely located and controlled from a central station. They are available in standard pipe sizes ¼, ⅜, ½ and ¾ in.



For further information write to Airmatic Valve, Inc., 7313 Associate Ave., Cleveland 9, Ohio.

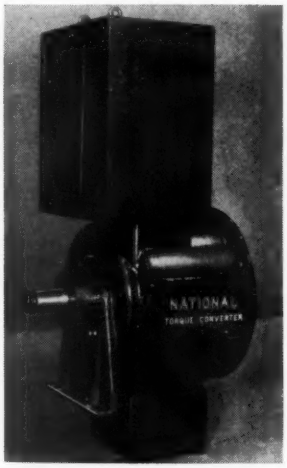
Fast Acting Jack Pump

THE AIR POWERED HYDRAULIC PUMP, known as No. P7A, is usable with all single and two-way Simplex "Re-Mo-Trol" rams, and is said to lift seven times faster than a hand pump. It has a displacement of 42 cu in. of oil per minute and reportedly will raise a 60-ton capacity ram one in. in 20 sec.

For additional data on the 44-lb Simplex pump write for bulletin: "Hydraulic: 56 in." Address, Templeton, Kenly & Co., 2525 Gardner Rd., Broadview, Ill.

Torque Converters

SINGLE-STAGE torque converters for use on mining machinery are now being manufactured in a range of 100 to 1000 hp. This has been accomplished with six basic sizes which in-



cludes 17 power capacities in closely spaced ranges for exact matching with engines and electric motors. These power ranges are provided by modification of the converter hydraulic circuit.

obtained from The National Supply Co., Two Gateway Center, Pittsburgh, Pa.

Multi-Purpose Pump

THIS 3000 GPH submersible multipurpose pump includes a built-in check valve, air lock eliminator, Kenco-GE Switchette Control and thermoplastic cord and cap. The Model 140



is designed for both completely automatic intermittent operation and for continuous submerged duty.

The built-in check valve prevents water from running back into the pit after the pump stops and the Kenco air-bleed valve allows rising water to expel air, but instantly closes when pump starts.

Write Kenco Pump Division, a division of the American Crucible Products Co., 1305 Oberlin Ave., Lorain, Ohio, for complete information.

Hydraulic Circuit Tester

HAVING A PRESSURE RANGE of 300 to 2000 psi, a maximum flow of 50 gpm and a temperature gauge reading from 60 to 220° F., the Schroeder Hydraulic Circuit Tester simultaneously measures temperature, pressure and flow from any component part in a hydraulic system. Called the Model PT-50-B, the 19-lb tester is connected by hose to the component part to be tested and to a low pressure return line. Load is applied manually by the load valve with the result showing on the flow and pressure gauges.



Descriptive literature is available from Schroeder Brothers Corp., 3116 Penn Ave., Pittsburgh 1, Pa.

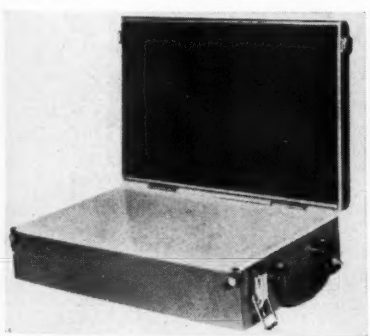
Chain Saw

WEIGHING 26 LB COMPLETE with 18-in. bar and chain, this chain saw has direct drive, adjustable, fixed-jet carburetor controlling engine-overspeed and new design contoured-teeth high efficiency router chain.

For more information about the new Mall "GP", write the Mall Tool Co., 7725 S. Chicago Ave., Chicago 19, Ill.

Photocopier

DESIGNED TO COPY PAGES of bound books just as easily as flat material, a portable photocopier was recently introduced by Remington Rand. Weighing 13 lb complete with cover,



the all-metal unit produces full-size copies of any record—typed, printed, or handwritten, on paper, cloth, film, or even heavy card stock. It will photocopy by direct light transmission or by reflected light.

Write Remington Rand, a division of Sperry Rand Corp., 315 Fourth Ave., New York 10, N. Y.

— ANNOUNCEMENTS —

Maxwell D. Millard has been appointed general sales manager of the **American Steel & Wire Division of U. S. Steel Corp.** Millard had been director of distribution and availability in the Pittsburgh offices of U. S. Steel Corp.

A new District Office and Warehouse for its Mining Division has been opened in Evansville, Ind., by **The Jeffrey Mfg. Co. Thomas E. Davis** is district manager and **Owen Donham** is warehouse manager.

The new concrete block structure, located at 1066 Diamond Ave. has two offices for district and warehouse business occupying the front area.

Nordberg Mfg. Co. announces two recent appointments. **Jacob S. Risley, Jr.,** is sales and service representative of the Crusher Division in the Northwest Pacific area and **William S. Presse** is sales and service representative of the Crusher Division in the Province of Quebec.

Dorr-Oliver Incorporated has reorganized its Sales Department under **T. Bartow Ford,** vice-president in charge of sales. Under the reorganization, Lines Sales shares equal broad responsibilities with sales services. Lines of communication, although following the established pattern, will be shortened and made more flexible.

William E. Smith has been designated general sales manager and is responsible for all line sales.

Glen G. Reed has been named manager of sales services and is responsible for D-O field engineering, new product promotion, and organization of equipment distributorships.

Industrial Sales continues under **Glenn O. Wilson,** manager, with **Theodore T. Meehan** named to the post of assistant to the manager. The new post of special assistant to the industrial sales manager has been filled by **Daniel C. Gillespie,** who will assist Wilson in the handling of products formerly marketed by Merco Centrifugal Co.

John R. McCaffrey has been elected chairman of the board of directors and chief executive officer of **International Harvester Co.** at a special meeting of the board of directors. **Peter V. Moulder,** formerly executive vice-president, was elected president of the company to succeed McCaffrey. **Frank W. Jenks,** formerly vice-president in charge of merchandising services, was elected executive vice-president and **Harry O. Bercher,** formerly vice-president in charge of the steel division and purchasing and traffic, was elected executive vice-president. McCaffrey has also announced that **Christian E. Jarchow,** executive vice-president since 1952, will continue to serve in that capacity.

Joy Mfg. Co. announces the appointment of **R. T. Hair,** former product manager, to sales manager of the company's coal division.

Hair became associated with Joy in 1943, as a development engineer, and has since held various positions with the company, including that of general service manager and, most recently, manager of loader and continuous miner products.



R. T. Hair

He has been succeeded as manager of loader and continuous miner products by **A. William Calder.** Calder joined the Joy organization in 1948 as a field engineer and, most recently, was the chief engineer of Joy's Claremont, N. H. plant.

J. C. Baseheart is engine sales manager, and **F. M. Borwell** is assistant engine sales manager of the **Buda Division, Tractor Group, Allis-Chalmers Mfg. Co.,** with headquarters at the home office in Milwaukee, Wis. Baseheart was in charge of engine sales and Borwell was special district representative, engine sales, for the Buda Division, Harvey, Ill.

CATALOGS & BULLETINS

ASCO SOLENOID VALVES. *Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.* A 32 pp. condensed valve catalog, No. 201, describes the latest designs in ASCO's extensive line of Two, Three, and Four Way Solenoid Valves. It contains engineering information, flow charts, operation and construction details, illustration and prices.

AUTOMATIC COAL SCALE. *Richardson Scale Co., Van Houten Ave., Clifton, N. J.* Operation, components and auxiliary equipment for two models of high-speed automatic coal scales are described in Bulletin No. 0352A. Designated H-39, the Richardson Coal Scale is available in a 200-lb model with an hourly capacity up to 20 tons, and a 500-lb model with an hourly capacity up to 40 tons.

DRY PROCESSING EQUIPMENT. *Sturtevant Mill Co., 150 Clayton St., Boston 22, Mass.* Entitled "Sturtevant Dry Processing Equipment—the 'Open-Door'

(*Continued next page*)

to Lower Operating Costs over more years," the brochure deals mainly with production equipment but details of laboratory units are included as well. Specifications and photos of crushers, grinders, pulverizers, micron-grinders, separators, granulators, blenders, mixers, feeders, screens, elevators, conveyors, mechanical dens and excavators are included.

ENGINEERING DESIGN CONSTRUCTION. *W. K. E. Division, Western Machinery Co., 760 Folsom St., San Francisco 7, Calif.* Recently released by W. K. E. Division of Western Machinery Co. is a 28 pp. folder describing in considerable detail its operations and experience in doing engineering, design and construction on mines, mills, process plants and other facilities. The company indicates it is prepared to handle any phase from preliminary design to turn-key jobs of any size.

GRINDING MILL FEED CONTROL. *Hardinge Co., Inc., 240 Arch St., York, Pa.* Bulletin No. 42-A discusses the operating principle of the "Electric Ear," an electronic device which automatically regulates the flow of feed material, wet or dry, to a continuous grinding or pulverizing mill, illustrates typical installations, and provides information on its correct application.

GENERAL-PURPOSE CENTRIFUGAL PUMPS. *Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.* The complete line of class CRV cradle-mounted centrifugal pumps is covered in this bulletin, Form 7223-B. Pumps described have capacities from 5 to 2800 gpm and pressures of 10 to 525 ft total head.

ALLIS-CHALMERS WOUND ROTOR MOTORS. *Allis-Chalmers Manufacturing Co., 972 S. 70th St., Milwaukee, Wis.* Construction features of Allis-Chalmers wound rotor motors for a variety of applications are described in Bulletin 51B-8195A. The motors are reportedly designed for use wherever high starting torque with low starting current is needed, power supply is limited, intermediate speeds are required, smooth acceleration is desired, or where high inertia loads must be accelerated.

TRUCK OPERATORS HANDBOOK. *B. F. Goodrich Tire & Equipment Co., Akron, Ohio.* This 64-page illustrated handbook on highway and off-the-road tires includes a tire selection chart and load and inflation tables for tires in highway, earthmoving, mining, logging and road grader service. Tire care is discussed and facts about tubeless truck tires and nylon construction given, as well as data on the company's complete line of highway and off-the-road tires.

SCRAPERS. *Euclid Div., General Motors Corp., Cleveland 17, Ohio.* Three catalogs have been published describing the overhung engine line of Euclid Scrapers. Condensed specifications are included to provide data on engines, transmissions, tires, scraper controls, weights and dimensions. Performance table, illustrations and action views are given. Catalog 505 covers the S-7 Scraper, 506 the Model S-12, 507 the model S-18.

KREBS VALVES. *Equipment Engineers, Inc., 41 Sutter St., San Francisco 4, Calif.* Bulletin No. 65 on Krebs heavy duty valve contains performance curves illustrating how round hole closing makes a difference compared with conventional pinch valves.

LUBRICATION SYSTEMS. *Dravo Corp., Industrial Dept., Fifth and Liberty Ave., Pittsburgh 22, Pa.* Bulletin No. 1450 covers the Dravo-DeLaval Lubrication and Coolant Systems. It contains several pictures of typical installations and a diagram of a mill lubrication system. In addition the four-page bulletin discusses the company's Unilube Units, which are "packaged" lubrication system reportedly designed to meet the need for a full pressure feed lubrication system in capacities up to 50 gpm.

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new Bowdil TRIMMER CHAIN



FOR ALL MAKES CONTINUOUS BORING MACHINES

USES BOWDIL THROW-AWAY OR ½" x 1" SHANK BITS

CHAIN PITCH MAY BE VARIED BY CHANGING COUPLERS ONLY

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"Talk up" increased production—greater safety...with these M-S-A COMMUNICATION SYSTEMS

M-S-A MINEPHONE

Dispatcher sends orders instantly and simultaneously to all motormen with this modern, underground two-way voice communication system. Motormen receive and reply while trips are in motion—keep haulage movements coordinated with production demands. This results in smoother, faster, and more continuous trip movements throughout the mine.

Messages clear tracks for outgoing loaded trips and incoming empties. This system puts an end to traffic tie-ups, errors and accidents; prevents excessive stop-and-start strain on equipment. Write for more detailed information.



• Dispatcher sends orders to motormen . . . routes right-of-way traffic . . . receives reports on positions and station conditions.

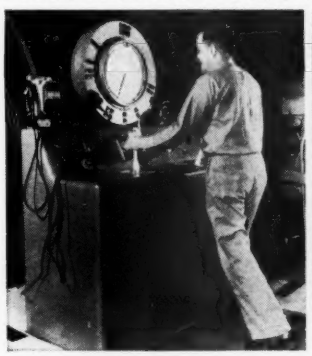


• "Jeep" operator requests instructions from dispatcher and maintenance shop for section assignment . . . speeds emergency repair.

M-S-A HOISTPHONE

For accurate, instant response between the hoisting engineer and cage, here's the voice communication system to install. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M-S-A HoistPhone provides better safety and efficiency through dependable, continuous two-way voice communication at any level, and while the cage is in motion.

Requires no special training . . . simple to use . . . dependable in operation. Write for further information.



• The hoisting engineer is able to control all movements of the cage by communicating with cage rider over the M-S-A HoistPhone.



• Worker uses microphone in cage to tell the hoisting engineer where he wants to go. Loudspeaker mounted on top of cage.

MSA

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When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY

201 North Braddock Avenue, Pittsburgh 8, Pa.

At Your Service: 77 Branch Offices in the United States and Mexico

MINE SAFETY APPLIANCES CO. OF CANADA, LTD.

Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

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